Report on Public Hearings

City of Brandon Industrial Wastewater Treatment Facility Expansion and Maple Leaf Foods Inc. Hog Processing Plant Alteration

Presiding:

Terry Duguid, Chairperson
Judy Head
Wayne Sato
John Whitaker

October 2003

Manitoba Clean Environment Commission
305-155 Carlton Street
Winnipeg, Manitoba R3C 3H8

www.cecmanitoba.ca

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Executive Summary

The City of Brandon received an *Environment Act* licence in 1999 for an Industrial Wastewater Treatment Facility dedicated to the Maple Leaf Foods Inc. hog processing plant. In addition, the City of Brandon was licenced in 2001 to apply biosolids from the facility's anaerobic basin to agricultural land. Concurrently, Maple Leaf Foods was licenced to operate its hog processing plant adjacent to Brandon's treatment facility. Maple Leaf's licence provided for two shifts per day, but the plant was restricted to one shift per day until the City of Brandon receives a licence authorising its facility to accept wastewater generated by the second shift.

On March 19, 2003, Manitoba Conservation received an *Environment Act* proposal from the City of Brandon for alterations to its existing Industrial Wastewater Treatment Facility and a Notice of Alteration from Maple Leaf Foods for modifications to its existing hog processing plant in Brandon. Both proposals were submitted to facilitate a two-shift-per-day operation of the hog processing plant. On March 24, 2003, the Manitoba Minister of Conservation referred the Maple Leaf Foods and City of Brandon proposals to the Manitoba Clean Environment Commission. The Minister also established a $50,000 Participant Assistance Program for the hearing and called for applications by April 21, 2003. The mandate given to the Commission was to conduct a public hearing on the proposals, receive public comments and concerns, and provide a report with advice and recommendations to the Minister. In response to a concern expressed by the Westman Community Action Coalition on the scope of the review, the parties agreed that an opportunity would be provided to discuss this at the commencement of the hearing.

The Commission conducted hearings in Brandon on June 25, 26 and 27, 2003 and on July 15 and 16, 2003. Opening arguments by Manitoba Conservation, the proponents (Maple Leaf Foods and the City of Brandon) and the Westman Community Action Coalition on interpretation of the *Terms of Reference* were heard. The Commission decided on June 26, 2003 to allow evidence and cross-examination respecting the impact of hog production in Manitoba as it related to the proposed development. A motion tabled by the funded participant group on June 26, 2003 calling for a suspension of the hearings until information was provided on a socio-economic impact assessment, an instream flow model for the Assiniboine River and the impact of hog production in Manitoba was dismissed on June 27, 2003.

About 120 members of the public including private citizens, business owners, government workers, consultants, environmental practitioners and students attended the hearings in

Brandon. The Commission heard presentations and statements from Maple Leaf Foods, the City of Brandon, Manitoba Departments of Conservation, Agriculture and Intergovernmental Affairs, and Environment Canada, as well as the funded participant group. Written and oral presentations were also received from 11 other organizations and individuals. The Commission registered a total of 95 exhibits during the five days of hearings.

During the course of the hearing, the Commission heard a variety of concerns from individuals, organizations, funded participants, and local and federal government representatives regarding the Maple Leaf Foods and City of Brandon proposals. The concerns related to wastewater treatment technology, biophysical and socio-economic impacts, groundwater contamination, greenhouse gas emissions, water use, effluent quality, receiving water quality, biosolids and manure spreading, parasites and pathogens, drug and hormone use, in-stream flow requirements, cumulative impact, sustainability, regulatory process, environmental management systems, plant worker health and safety, family farm and rural lifestyle issues and others. Common themes included availability of study and monitoring results, assimilative capacity of the Assiniboine River, sustainability of hog production, regulation of hog production operations and environmental management systems.

Based on the evidence presented during the hearing, the Commission determined that the proposal by Maple Leaf Foods and the City of Brandon to expand the capacity of the Industrial Wastewater Treatment Facility would not likely result in significant additional biophysical impact on the local environment and, due to lower nutrient concentrations in the effluent, would improve the downstream river environment. The Commission observed that the results of the pilot tests carried out by Zenon Environmental Inc. indicate the proposed expansion can achieve lower effluent nutrient concentrations than would otherwise be required to meet the Manitoba Conservation criteria of "no net increase" in nutrient loading to the Assiniboine River. The Commission concluded that licence terms and conditions should reflect effluent nutrient concentrations attained during pilot testing. It was also concluded that the City of Brandon should obtain a performance guarantee or bond from the supplier of the membrane system to protect taxpayers against additional costs.

The Commission was not convinced one way or the other about the sustainability of hog production in Manitoba in relation to the Maple Leaf Foods hog processing plant based on evidence presented during the hearing. However, the Commission acknowledged that Elite Swine Inc., a subsidiary of Maple Leaf Foods, is continuing to incorporate procedures that

appear to make large-scale hog production in the province more sustainable. The matter of sustainability was not addressed satisfactorily by the cumulative effects assessment and the sustainability analysis in the proponent's Environmental Impact Assessment documents. Consequently, the Commission determined that Manitoba Conservation in cooperation with Manitoba Agriculture and Food, the Prairie Farm Rehabilitation Administration, the Manitoba Pork Council, local and Aboriginal communities, non-government organizations and universities should undertake a study on the sustainability of hog production in the Assiniboine River basin. The Commission also determined that the study should be based on currently available information, but acknowledges that new data may be required to investigate nutrient levels in surface and ground waters emanating from large-scale hog production operations.

The Commission observed that Manitoba Conservation, Maple Leaf Foods, Elite Swine and the City of Brandon appeared to possess basic environmental information from their respective monitoring programs, although that information was generally not available to the public. Also, adequate information on upstream and Brandon area nutrient sources, and results from the Assiniboine River in-stream flow requirements study was not provided during the hearing. The Commission determined that research and monitoring information should be compiled, reported on annually, and made available to the public so that it can be used for ongoing planning, management and decision-making. The Commission also determined that the number of parameters routinely measured by surface water, groundwater and soil monitoring programs should be increased to include such parameters as conductivity, heavy metals, parasites and pathogens (e.g. *Cryptosporidium, Giardia and E. coli*), organochlorines, pharmaceuticals and other parameters determined to be of concern through periodic screening.

The Commission viewed the implementation of ISO 14001-certified Environmental Management Systems by Maple Leaf Foods and the City of Brandon as effective means of achieving a higher degree of environmental and human health protection in Manitoba. Extension of Environmental Management Systems by Maple Leaf Foods to regional hog production operations, activities and suppliers under their control will broaden the coverage of this protection. The Commission believes that these management systems will serve to "raise the bar" for other livestock production operations in the province.

The Commission concluded that the Director, Environmental Approvals Branch may issue revised *Environment Act* licences to Maple Leaf Foods for alterations to its hog processing plant

and to the City of Brandon for an expansion to its Industrial Wastewater Treatment Facility subject to terms and conditions consistent with the recommendations outlined in this report.

In summary, the Commission presented the following 13 recommendations:

A. Licencing

1. Manitoba Conservation should issue *Environment Act* licences to Maple Leaf Foods for an alteration to its Brandon hog processing plant and the City of Brandon for an expansion of its Industrial Wastewater Treatment Facility. The licences should be reviewed by Manitoba Conservation one year after the expanded wastewater treatment facility is put into operation for adherence to the terms and conditions.

B. Licence Terms and Conditions

2. The licence limits for nutrients in the effluent from the City of Brandon Industrial Wastewater Treatment Facility should be set at 1 milligram per Litre for total phosphorus and less than 10 milligrams per Litre for total nitrogen for the entire year.

3. The licence for the City of Brandon Industrial Wastewater Treatment Facility should include a requirement for the City of Brandon to secure a performance guarantee and letter of credit or bond from the supplier of the treatment system to ensure that effluent limits are achieved and Brandon and Manitoba taxpayers are protected.

4. Maple Leaf Foods and the City of Brandon should be required to immediately begin development and implementation of ISO 14001-certified Environmental Management Systems for their respective hog processing and industrial wastewater treatment facilities, and complete their Environmental Management Systems by December 2005.

5. Maple Leaf Foods should require Environmental Management Systems consistent with the ISO 14001 Standard for hog production operations in Manitoba under its control by December 2005 and should encourage Environmental Management Systems for its suppliers.

6. Within 12 months of receiving Environment Act Licences, both Maple Leaf Foods and the City of Brandon should be required to complete water audits of their respective hog processing and industrial wastewater treatment facilities, and prepare water conservation plans with strategies and targets for reducing water use.

7. Maple Leaf Foods and the City of Brandon should be required to conduct quarterly groundwater monitoring at high risk locations adjacent to their respective hog processing and industrial wastewater treatment facilities.

8. The City of Brandon should be required to prepare sludge management plans for the land application of biosolids from its Industrial Wastewater Treatment Facility. The management plans should be updated annually, audited on a routine basis and be made accessible to the public.

9. Within 12 months of receiving Environment Act Licences, both Maple Leaf Foods and the City of Brandon should be required to complete greenhouse gas inventories of their respective hog processing and industrial wastewater treatment facilities and prepare greenhouse gas management plans with reduction strategies and targets.

10. The City of Brandon should be required to increase the number of parameters measured in effluent from the Industrial Wastewater Treatment Facility to include conductivity, heavy metals, parasites and pathogens (e.g. *Cryptosporidium, Giardia and E. coli*), organochlorines, pharmaceuticals and other parameters determined to be of concern from periodic effluent screening.

C. Other Matters

11. Manitoba Conservation, in cooperation with Manitoba Agriculture and Food, the Prairie Farm Rehabilitation Administration, the Manitoba Pork Council, local and Aboriginal communities, non-government organizations and universities should oversee a study to examine the sustainability of hog production in the Assiniboine River basin, develop sustainability indicators, and report to Manitobans by December 2005 with an interim report due December 2004.

12. Manitoba Conservation should establish additional monitoring stations along the Assiniboine River to ensure that adequate water quality data are available for planning and management decisions in the basin.

13. Manitoba Conservation should be directed to complete and report on the Assiniboine River in-stream flow requirement study by March 2004. Consideration should be given to the establishment of a cooperative watershed planning initiative to provide long-term environmental stewardship for the Assiniboine River basin.

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Introduction

Background

The City of Brandon received an *Environment Act* licence in 1999 to design, construct and operate an Industrial Wastewater Treatment Facility dedicated to the Maple Leaf Foods Inc. hog processing plant at Brandon, Manitoba. The licence specifies limits, terms and conditions regarding influent from Maple Leaf's hog processing plant, effluent discharged into the Assiniboine River, surface and groundwater, air emission, solid wastes and other matters. In addition, the City of Brandon was licenced under *The Environment Act* in 2001 to apply biosolids from the anaerobic basin of the Industrial Wastewater Treatment Facility on agricultural land.

Concurrently, Maple Leaf Foods obtained an *Environment Act* licence in 1999 to operate its hog processing plant adjacent to the Industrial Wastewater Treatment Facility. The licence limits hog production rates to no more than 10,800 hogs per day and 54,000 hogs per week for a one-shift-per-day operation. The licence provides for two shifts per day, but the operation is restricted to one shift per day until the City of Brandon receives a licence authorising its treatment facility to accept wastewater generated by a second shift at Maple Leaf's facility.

On March 19, 2003, Manitoba Conservation received an *Environment Act* proposal from the City of Brandon for alterations to its existing Industrial Wastewater Treatment Facility, and a Notice of Alteration from Maple Leaf Foods for alterations to its existing hog processing plant in Brandon. Both documents had been submitted to facilitate a two-shift-per-day operation of the hog processing plant.

Public Hearing

On March 24, 2003, the Manitoba Minister of Conservation requested that the Clean Environment Commission conduct a public hearing to consider the City of Brandon proposal, and to receive public comments and concerns respecting the proposal. In consultation with representatives of Maple Leaf Foods, the City of Brandon, Manitoba Conservation and the Westman Community Action Coalition on June 17, 2003, it was agreed that an opportunity would be provided to discuss the scope of the hearing at the commencement of the proceedings. The hearing was subsequently conducted in Brandon from June 25 to 27, 2003 and on July 15 and 16, 2003.

The Westman Community Action Coalition, Manitoba Conservation and the proponents presented arguments at the beginning of the hearing on June 25, 2003 concerning their interpretation of the

Terms of Reference respecting hog production. The Coalition argued that the Terms of Reference should be interpreted broadly to include hog production in Manitoba, while Manitoba Conservation and the proponents argued for a narrower interpretation. The Commission subsequently ruled on June 26, 2003 that the presentation of evidence and cross-examination respecting the environmental impact of hog production in Manitoba would be allowed, but only as these related to the proposed development.

A member of the Coalition presented a motion on June 26, 2003 asking for suspension of the hearings until a sufficient socio-economic impact assessment, in-stream flow model for the Assiniboine River with numerical values, and impacts of hog production in Manitoba as theyrelate to this development have been provided by the proponents. The Commission dismissed this motion on June 27, 2003.

Purpose of Report

The purpose of this report is to provide the Minister of Conservation with recommendations respecting proposed alterations to the licencing of the City of Brandon Industrial Wastewater Treatment Facility and the Maple Leaf Foods hog processing plant. These recommendations include comment on potential environmental, socio-economic, cultural and health impacts of the proposed alterations along with possible mitigation measures, monitoring activities, and research opportunities.

Report Organization

Preamble and background information is provided in the Introduction, Public Hearing Process, Development Description, and Regulatory Context sections. Evidence presented at the hearing by the proponent, the regulators, the funded participant group and the public, as well as conclusions by the Commission are summarized in the Issues section. The Observations section contains comments and suggestions for consideration by government on matters of interest to the Commission's review. The Recommendations section provides advice and direction to the Minister of Conservation on matters of concern directly related to the *Terms of Reference* for the hearing. The Appendix includes a glossary of terms used in the report.

Public Hearing Process

Clean Environment Commission

The Manitoba Clean Environment Commission Is an arms-length provincial agency appointed under the authority of Manitoba's *Environment Act*. The Commission encourages and facilitates public involvement in environmental matters, and offers advice and recommendations to the government on sustainable development, environmental issues and licencing matters. Its mandate is exercised through public hearings, investigations, mediation and education. Membership includes a full-time Chairperson and fifteen part-time Commissioners appointed by Order-in-Council.

The Commission of Commissioners formed for the City of Brandon Industrial Wastewater Treatment Facility public hearing consisted of Terry Duguid (Chairperson), Judy Head, Wayne Sato and John Whitaker.

Participant Assistance Program

The Minister of Conservation established a $50,000 Participation Assistance Program for the hearing, and requested that the Commission form a Participation Assistance Committee to consider applications received for funding. The Committee, consisting of Commissioners Connie Pringle, John Hreno and Archie Phillips, recommended $34,000 be provided to the Westman Community Action Coalition, a group including representatives from the University of Brandon, Brandon and District Labour Council, Hog Watch Manitoba, The Organization and The National Farmers Union. The Coalition was funded to conduct research, engage experts and present evidence on the environmental impact of the Maple Leaf Foods hog processing plant and the City of Brandon Industrial Wastewater Treatment Facility.

Mandate and Scope

The Minster of Conservation requested that the Commission conduct a public hearing to consider the City of Brandon's proposal to expand its Industrial Wastewater Treatment Facility to accommodate Maple Leaf Foods' second shift operation. The Commission was also asked to provide a report to the Minister in accordance with Section 7(3) of *The Environment Act. Terms of Reference* for the public hearings are provided in Appendix A.

Notification

The public hearing on the City of Brandon's Industrial Wastewater Treatment Facility proposal was first announced in a Manitoba Government news release on March 24, 2003. The Commission advertised the dates, locations, times and other details for the hearing through notices placed in the Winnipeg Free Press, the Brandon Sun and the Portage Daily Graphic on April 26, 2003. Notices of the hearing were mailed to over 120 government offices, businesses, organizations and individuals. Notification of the hearing was also posted on the Manitoba Conservation and the Commission web sites.

Schedule and Format

The first session of the public hearing was held in Brandon, Manitoba on June 25, 26 and 27, 2003. The hearing continued in Brandon on July 15 and 16, 2003. The format for the hearing consisted of opening remarks by the Commission Chairperson, followed by presentations by Manitoba Conservation, Manitoba Agriculture and Food, Manitoba Intergovernmental Affairs, the City of Brandon and Maple Leaf Foods including their representatives and consultants, the Westman Community Action Coalition, private representations and from members of the public. All hearing participants were subject to questioning by each other, the Commission and the public. A list of registered presenters is provided in Appendix B.

The proceedings were recorded and transcripts of the hearing were produced for the public record. An audio CD was also made available to participants at the end of each day during the hearing. Written summaries were prepared after each session and posted on the Commission's web site.

Attendance

The Brandon hearing was attended by about 120 participants including private citizens, business owners, government workers, consultants, environmental professionals and students. Most of these attendees were from the Brandon area and Winnipeg, with several from rural Manitoba communities and Ontario.

Documentation

Reports produced by the City of Brandon and Maple Leaf Foods for the hearing, as well as related documents prepared by Manitoba Conservation, were placed in the Public Registry.

Documentation was also made available in electronic format on Manitoba Conservation's web site, which was also accessible through the Commission's web site.

Exhibits

A total of 95 exhibits were recorded during five days of public hearings (Appendix C).

Descriptions of the Developments

Maple Leaf Foods

Existing Hog Processing Plant – One Shift Operation

The Maple Leaf Foods hog processing plant is located 3.5 km southeast of Brandon and 0.5 km south of the Assiniboine River. The 50,634 m^3 plant was built in 1999 and consists of several main functional areas for receiving, holding, cooling, freezing, processing, shipping and administration. Maple Leaf is currently licenced to process 54,000 hogs per week and employs about 1,500 workers. Production from the single shift operation is about 9,000 hogs per day over a 5- or 6-day-per-week period. The maximum slaughter has been about 50,435 hogs during a five-day week and nearly 52,890 hogs during a six-day week. The plant does not process or smoke meat and produces no case-ready products. By-product operations include ham boning, blood and hair collections, stomach, casings and bung processing. No inedible rendering is practiced on-site, and all solid wastes generated by the processing plant are currently sent to an off-site processing facility.

Wastewater from the hog processing plant passes through a pre-treatment facility located north of the hog processing plant and south of the wastewater treatment facility. The influent wastewater enters three separate wet pits in series. The wastewater is then pumped toexternally-fed rotating screens to remove coarse materials, and then passed through dissolved air floatation tanks to remove grease and fine solids. The pre-treated wastewater is then drained to a wet pit from where it is pumped to the Industrial Wastewater Treatment Facility. The screenings and skimmings are collected and transported to an off-site rendering facility. The pre-treatment plant was designed for a peak hourly flow of 7.0 m^3 per minute and an instantaneous peak flow of 10.5 m^3 per minute.

An estimated 138 m^3 per day of sanitary waste from the hog processing plant is also pumped into the anaerobic lagoon, currently serving as the first treatment stage of the Industrial Wastewater Treatment Facility.

Proposed Hog Processing Plant Alteration – Two Shift Operation

Maple Leaf Foods is proposing to process up to 108,000 hogs per week and employ over 2,000 workers. The processing plant was initially designed for a two-shift-per-day operation so the proposed alterations, which address operational matters, are viewed to be relatively minor in

scale. The proposal includes additional holding pens and expanded cooler, carcass load-out, shipping and freezer areas, as well as other minor internal and external plant modifications. Additions to the plant total approximately 11,890 m^2 for a total facility area of approximately 63,524 m^2. The alterations are planned to take place over a three-year period as designs are finalized and budgets are approved. Products are proposed to remain essentially the same but ground and seasoned pork may eventually be produced.

Changes to the wastewater pre-treatment plant have been recommended by Maple Leaf Foods to improve the operation and maintenance of the facility and the quality of the recovered material for rendering off-site. Proposed alterations include modifications to the wet wells, pumping system, dissolved air flotation process, screening mechanism, skimmings handling, sanitation and other minor changes. These improvements are considered to have minimal impact on the peak hourly and instantaneous flow rates, and the quality of the pre-treatment wastewater. Because the wastewater flows generated for the second shift are expected to be the same as those for the existing operation, the pre-treatment capacity will remain the same. The amount of water treated will increase by about one-third with the introduction of the second shift. However, the amount of water consumed will not increase significantly since most of the water used in the hog processing plant is returned to the Assiniboine River after treatment.

City of Brandon

Existing Industrial Wastewater Treatment Facility

The City of Brandon's Industrial Wastewater Treatment Facility is located immediately north of the Maple Leaf Foods hog processing plant. The treatment facility receives process water from the Maple Leaf Foods pre-treatment facility and sanitary sewage from the hog processing plant, and discharges treated wastewater into the Assiniboine River.

The existing Industrial Wastewater Treatment Facility consists of several process stages including a covered anaerobic lagoon, a two-stage (anoxic and oxic) activated sludge system and an ultraviolet effluent disinfection system including sampling, metering and discharge facilities. The covered and lined anaerobic lagoon is designed to handle wastewater from the production of 54,000 hogs per week with an influent flow of 31,200 m^3 per week. Other design parameters for the treatment facility are listed below:

Parameter	Maximum Week	Influent Concentration
COD	103,740 kg/wk	3,325 mg/L
$CBOD_5$	59,280 kg/wk	1,900 mg/L
Total Suspended Solids (TSS)	39,312 kg/wk	1,260 mg/L
Total Kjeldahl Nitrogen (N)	6,145 kg/wk	197 mg/L
Total Phosphorus (P)	1,000 kg/wk	32 mg/L
Oil and Grease (O&G)	5,865 kg/wk	188 mg/L

Soluble biodegradable organic contaminants discharged from the anaerobic lagoon are digested and ammonia is converted to nitrate within the second (aerobic) stage of the activated sludge process. Liquid from the second stage is pumped back to the first (anoxic) stage where nitrate is converted to nitrogen gas that is then released to the atmosphere. The first stage conversion of nitrate to nitrogen gas was incorporated into the process design primarily to recover alkalinity, and thereby prevent the pH of the liquid from decreasing and adversely affecting the efficiency of the second stage ammonia removal process. The release of nitrogen gas in the first stage also reduces the total nitrogen in the effluent. However, nitrogen removal was a secondary consideration to ammonia reduction and has not been optimized in the process.

The final effluent is metered, treated with an ultraviolet disinfection system and then sampled before being discharged into the Assiniboine River through a 375 mm-diameter gravity outfall.

Excess bacterial sludge from the activated sludge process is returned to the anaerobic lagoon where it is digested. These digested "biosolids" are typically removed twice a year from the lagoon and applied to agricultural land in the Brandon region. In 2001 and 2002, the City of Brandon spread an estimated 563 dry tones of biosolids (3.2% solids content) on 123 ha of land. The typical one-shift effluent quality reported by the City of Brandon from November 2002 and January 2003 is listed below:

Parameter	Load	Effluent Concentration
Flow	4,330 m^3/day	-
CBOD5	-	13 mg/L (daily maximum)
Total Suspended Solids (TSS)	-	21 mg/L (daily maximum)
Nitrogen (TN)	10,578 kg/month (average monthly maximum)	-
Phosphorus (TP)	1,771 kg/month (average monthly maximum)	-
Oil and Grease (O&G)	Not measured	-
Total Coliform	-	10 MPN/100 mL
Fecal Coliform	-	18 MPN/100mL

Proposed Industrial Wastewater Treatment Facility Expansion

The proposed expansion of the Industrial Wastewater Treatment Facility is located east of the existing facility and north of the Maple Leaf Foods plant (Figure 4). The facility treatment capacity will be increased to treat wastewater generated by the first and second shift operations, as well as a clean-up shift. To accommodate the increased wastewater flow without increasing the nutrient loading to the Assiniboine River, Maple Leaf Foods and the City of Brandon are proposing to construct a new membrane-based activated sludge treatment facility to run in parallel with the existing, but somewhat modified, activated sludge plant.

Typical daily wastewater production from the processing plant has been 4,330 m^3 per day for a single shift, and is projected to rise to 6,700 m^3 per day with the second shift operation. The proposed new membrane-based activated sludge system will include a new equalization basin and a three-stage bioreactor incorporating membranes manufactured by Zenon Environmental Inc. The two parallel systems will have a total combined treatment capacity of 6,918 m^3 per day including 218 m^3 per day of sanitary wastewater.

It is projected that the discharge from the existing and proposed new treatment systems will have a combined release of 160 kg of total nitrogen per day (4,960 kg per month) to the Assiniboine River. This is reported to be 54% less than the current average monthly maximums of 10,758 kg per month discharged by the existing facility under a one-shift operation.

The existing system effluent has a phosphorus concentration of approximately 20.5 mg per Litre, discharging about 33 tonnes of phosphorus per year into the Assiniboine River. By adding ferric chloride to the bioreactors, the treatment plant is expected to reduce the effluent total phosphorus concentration to less than 1.0 mg per Litre and the total phosphorus loading to the river to less than 2.5 tonnes per year.

The final effiuent will continue to be sampled and metered with the existing equipment, and disinfected using the existing ultraviolet disinfection facility but with additional lamps to increase its capacity. After disinfection the final effluent will continue to flow by gravity through the existing discharge pipe to the Assiniboine River.

Regulatory and Policy Context

Hog Production Regulation

The Environment Act

The intent of *The Environment Act* is to develop and maintain an environmental management system in Manitoba to ensure that the environment sustains a high quality of life, including social and economic development, recreation and leisure for this and future generations. The Act complements provincial planning and policy mechanisms, provides for the environmental assessment of development proposals, and involves the public in environmental decision-making.

Regulations under *The Environment Act* relevant to the City of Brandon Industrial Wastewater Treatment Facility expansion and the Maple Leaf Foods hog processing operation alteration are the *Classes of Development Regulation*, *Licencing Procedures Regulation* and the *Livestock Manure and Mortalities Management Regulation*.

The *Classes of Development Regulation* (164/88) lists three classes of developments that require a licence under *The Environment Act*. The hog processing plant is a Class 1 development, while the Industrial Wastewater Treatment Facility is a Class 2 development.

The *Licencing Procedures Regulation* (163/88) outlines the proposal requirements, and assessment and review procedures to obtain a licence under *The Environment Act*. Separate procedures are defined for Class 1 and Class 2 developments.

The *Livestock Manure and Mortalities Management Regulation* (42/98) prescribes requirements for the use, management and storage of livestock manure and mortalities in an environmentally sound manner. The regulation provides review and approval processes for livestock production operations. A permit is required to construct, modify or expand a manure storage facility, and large operations of 400 or more animal units must register a manure management plan annually. A number of amendments are being proposed to the regulation, including reduction of the size of operations requiring manure management plans from 400 to 300 animal units.

The Planning Act

The land use planning relationship between the Province of Manitoba and local government is governed by *The Planning Act*. The Act sets out a public review process for the adoption of a development plan, zoning by-laws and other processes such as conditional use and variation

orders. Most development plans treat livestock operations as a permitted or conditional use in rural and agricultural zones under such jurisdictions' zoning by-laws, depending on the size of the operation. *The Planning Act* sets out the conditional use process for land use where they are identified in the municipal zoning by-law. In 2000, the Province amended the conditional use provisions specifically as they related to larger (400+ animal units) livestock operations.

A new local land use review process for siting specific livestock operations is proposed to replace the conditional use process under *The Planning Act.* Under the new process, local councils would have decision-making authority over all livestock operations of 300+ animal units, would require a public notice process, a local hearing and a Technical Committee Report. Another thrust of the proposal is to provide the authority for a new regulation on siting and setbacks of livestock operations based on the existing *Farm Practices Guidelines* [(1)].

The Provincial Land Use Policies Regulation (184/94) under *The Planning Act* establishes land use polices to guide provincial government and local authorities undertaking and reviewing land use plans. The policy objective for agriculture is to enhance and foster stable economic growth that is environmentally sustainable by encouraging development of agricultural lands in a manner that will enhance production and agricultural diversification.

The Water Rights Act

The *Water Rights Act* regulates all rights for the use or diversion of water in the Province of Manitoba. Under this Act, no person is permitted to divert water or to construct, establish or maintain works except under a valid licence. The Minister of Conservation may issue a licence to any person who applies for the use or diversion of water for any purpose or for the construction, establishment or maintenance of works for any purpose. Where a person is using or diverting water or has constructed or established any works that contravene the Act, the Minister may order the person to cease using or diverting the water, remove the works or repair or reconstruct or alter the works.

The Water Rights Regulation (126/87) under *The Water Rights Act* defines licence application requirements and outlines licencing procedures and fees. Any person who proposes to withdraw more than 25,000 L of water per day from any surface or groundwater source must first obtain a Water Rights Licence.

Livestock Stewardship Panel Report

The 2000 Livestock Stewardship Panel report, "*Finding Common Ground*", presented some 40 recommendations for sustainable livestock development in Manitoba [(2)]. Key recommendations dealt with the role of the provincial government in sustainable livestock development, publicly available information on the effects on environmental quality, the role of intensive livestock operations in rural development, and the decision process for siting intensive livestock operations. In 2002, the Province announced a comprehensive plan for sustainable growth of the livestock sector which focuses on management of livestock operations, research and information, and the land use decision making process.

The new policy direction provides province-wide standards in terms of development plan requirements for livestock operations, and a new municipal development review process for livestock operations. All municipalities would be required to adopt or amend a development plan by-law to include a livestock operation policy to define where livestock operations may be permitted, restricted or prohibited. The livestock operations policy would be subject to public notification, hearing and appeal in accordance with requirements of *The Planning Act*.

Water Quality Standards, Objectives and Guidelines

Manitoba's Water Quality Standards, Objectives and Guidelines [(3)] provide for the protection of surface and ground water as well as overall ecosystem integrity in the province They have been subject to public, stakeholder and technical review, and are at the final draft stage. Standards, objectives and guidelines are provided for over 100 materials including dissolved oxygen, nutrients, fecal coliforms, metals, etc. They are provided as Tier I Standards, Tier II Objectives and Tier III Guidelines. The three-tiered approach is used to consolidate and harmonize Manitoba's approach with that developed through other programs in Canada.

A variety of scientific tools and management strategies are used in a proactive manner to protect, maintain and rehabilitate water quality in Manitoba. Two water quality management strategies are used simultaneously. First, all activities and waste discharges are controlled to the extent that it is reasonably practical and economically feasible using a consistent technology-based approach. Second, when more stringent environmental controls are required to protect important water uses, a water quality-based approach is used. Additional environmental limits are derived to ensure that applicable water quality standards, objectives and guidelines are not exceeded.

Modifications are made to the *Water Quality Standards, Objectives and Guidelines* as the region-specific or site-specific objectives are developed and new principles relating to environmental protection in Canada are formulated through national processes such as the Canadian Council of Ministers of the Environment.

Nutrient Management Strategy

A draft *Nutrient Management Strategy for Southern Manitoba* was released for public review in 2000 to address the issue of enrichment of Manitoba's surface waters with plant nutrients such as nitrogen and phosphorus [4]. The draft strategy identified the main challenges, tasks and issues that will have to be considered in the development of appropriate water quality objectives for prairie streams and receiving lakes such as Lake Winnipeg. As required, the strategy also involves development of an implementation plan if reductions of nutrient loadings are required. The strategy is scheduled to undergo public and stakeholder review before being finalized in 2004.

Lake Winnipeg Action Plan

The Minster of Conservation announced a six-point *Lake Winnipeg Action Plan* in February 2003[5]. The *Action Plan* included establishment of a Lake Winnipeg Stewardship Board to help Manitobans identify further actions necessary to reduce nitrogen and phosphorus by 13% or more, subject to further findings of the nutrient management strategy. Other actions in the plan included enhanced riparian protection, better programs for soil testing, tightened regulations for sewage and septic systems and additional requirements for larger treatment systems.

Water Strategy

The Lake Winnipeg Action Plan was subsequently incorporated into Manitoba's *Water Strategy*, which was announced in April 2003 [6]. The goal of the *Water Strategy* is to develop watershed-based planning across the entire province to ensure that future management of specific water issues is done carefully. A sustainable approach is required to ensure that all needs are met while maintaining ecosystem protection. The strategy identifies six interrelated policy areas: water quality, conservation, use and allocation, water supply, flooding and drainage. The objective of Manitoba's water quality policies is to protect and enhance aquatic ecosystems by ensuring that surface and ground water quality is adequate for all designated uses and ecosystem needs. The use and allocation objective is to ensure the long-term sustainability of the province's surface and groundwater for the benefit of all Manitobans.

Issues

This section presents information on environmental and other issues raised by the public, the government intervenors and the Commission at the public hearing on the Maple Leaf Foods hog processing plant alteration and the City of Brandon's Industrial Wastewater Treatment Facility expansion. The issues include matters of concern, contention or disagreement that fall within the Commission's *Terms of Reference*, and warrant further consideration and action by government. A concluding statement summarizing the Commission's opinion is highlighted at the end of each issue. The information on issues is provided as background in support of the Commission's recommendations to the Minister. There is no implied order of importance in which the sequence the issues are presented.

Industrial Wastewater Treatment Technology

A representative of Earth Tech (Canada) provided background information on the City of Brandon's licence application for the expanded Industrial Wastewater Treatment Facility (Exhibit 17). The representative described the existing wastewater treatment process including the Maple Leaf Foods pre-treatment facility and the City of Brandon industrial wastewater treatment facility. The Earth Tech representative went on to describe the expanded system including inlet flow metering of the wastewater, a new equalization basin to absorb weekly wastewater flow variations, and a new mixing lift station before wastewater is discharged into the new treatment system. The representative also provided a brief overview of the Zenon membrane technology that is proposed for the expanded wastewater treatment plant.

A representative of HDR Engineering Inc. provided process information on the Maple Leaf Foods wastewater pre-treatment facility, the City of Brandon's Industrial Wastewater Treatment Facility, and the proposed expansion to accommodate Maple Leaf's second shift operation (Exhibit 23). Production from the existing single shift was reported to be about 9,000 hogs per day. Hog production for the double shift operation was reported to be about 18,000 hogs per day.

The HDR Engineering representative presented information on the Industrial Wastewater Treatment Facility expansion including effluent design criteria, and discussed existing Industrial Wastewater Treatment Facility influent design parameters, effluent discharge criteria and quantification of "no net increase" in monthly and weekly nitrogen and phosphorus loadings from the existing wastewater treatment process (Exhibit 23). The representative went on to provide a summary description of the costs as well as the pros and cons of the three alternative wastewater

treatment processes considered for the expanded Industrial Wastewater Treatment Facility to accommodate Maple Leaf's second shift operation.

The HDR Engineering evaluation determined that it was not possible to guarantee that effluent total nitrogen criteria would be consistently met with chemical and biological treatment system upgrades. Pilot testing of the Zenon membrane process conducted in late 2002 verified that the process could achieve high nitrogen removal efficiency. Like the existing treatment system, the proposed Zenon process includes an initial anoxic stage and a second aerobic stage, but also adds a secondary anoxic stage to optimize nitrogen removal. The HDR report concluded that if the Zenon system performs as indicated by pilot testing, the total system would achieve the desired effluent characteristics.

Based on the pilot test results, the Zenon representative determined that 73% of the flow and load would be treated by the new membrane bioreactor system and 27% by the existing system (Exhibit 26). A new equalization basin is proposed to be located ahead of both the new and existing wastewater treatment trains. The proposed membrane bioreactor process would generally include two anoxic pre-denitrification tanks, two aerobic nitrification tanks, one anoxic post-denitrification tank and four parallel trains of ZeeWeed™ membranes. The Zenon representative stated that the proposed membrane bioreactor approach is a reliable, robust approach to treat wastewater from the Maple Leaf Foods hog processing plant, and that use of the membrane bioreactor in conjunction with the existing Industrial Wastewater Treatment Facility would improve the quality of the effluent discharged to the river. The representative also stated that the Zenon membranes are not responsible for nutrient removal, but instead are designed to remove solids efficiently. It was also noted that the seed bacterial used in the pilot test was obtained from the existing treatment plant which is currently highly effective at converting ammonia to nitrate, but is operated sub-optimally with respect to converting nitrate to nitrogen gas and hence removing nitrogen from the wastewater. The Zenon representative stated that the company is prepared to guarantee the performance of its treatment system, whereas the HDR and Earth Tech engineers were uncertain whether an expanded facility using the existing treatment process could consistently achieve the required nitrogen removal. In support of this concern they provided data obtained from a similar treatment process for a meat packing plant that occasionally had high effluent nitrogen concentrations.

A representative of the Brandon Chamber of Commerce (Exhibit 41) expressed support of the proposed second shift at the Maple Leaf Foods hog processing plant and the expanded Industrial

Wastewater Treatment Facility. He noted that the environmental performance of the existing facility was determined to be acceptable, and the plan to use the Zenon membrane filtration system for the expanded facility was welcomed. The Chamber's representative stated that it would allow the production expansion to occur in an environmentally sustainable manner and it would improve upon the environmental performance of the current treatment facility. The representative explained that the Maple Leaf Foods hog processing plant has stimulated economic growth in the Brandon area, and the second shift production would bring even greater economic gains to the community.

A Westman Community Action Coalition member inquired about the $15 million cost of the Zenon membrane filtration system proposed for the Industrial Wastewater Treatment Facility, and asked whether Brandon taxpayers should be responsible for that cost. The status of a request for provincial and federal funding support for the Zenon proposal was not known by the proponents. Another Coalition member noted that there are many hidden costs of treating industrial wastewater that do not appear to be taken in account. A representative of Maple Leaf Foods clarified that the company is responsible for operating costs as well as other costs associated with operation of the Industrial Wastewater Treatment Facility, including its eventual decommissioning.

A member of the public expressed concern that the new sewage treatment system to be used by the City of Brandon for the Maple Leaf Foods hog processing plant is new and untried technology (Exhibit 40). The individual stated that the existing system uses "100-year old technology" and it seems to work "now and then". The individual also questioned whether the new Zenon membrane system can do the job, and noted that it appears to be more of a tertiary treatment system than a secondary system. Concern was noted that the manufacturer could only guarantee the performance and workmanship of the treatment plant when the operating specifications are followed.

The Commission acknowledges the environmental benefits of the City of Brandon's proposal to expand the Industrial Wastewater Treatment Facility by adding a membrane filtration process to ensure that wastewater from Maple Leaf Foods' second shift operation will not result in exceedences of Manitoba's Water Quality Standards, Objectives and Guidelines, and will decrease total nitrogen and phosphorus loadings to the Assiniboine River over levels currently being discharged.

The Commission is concerned, however, that the limited pilot testing carried out on the

proposed Zenon membrane filtration system may not have identified all potential operational problems associated with plant malfunctions, cold temperatures and clogged membranes (biofouling). High capital and operating costs, particularly for membrane replacement, could result in significant expense that may have to be assumed by Brandon and Manitoba taxpayers. This concern may be addressed by Zenon providing a performance guarantee and posting a letter of credit to cover any financial shortfalls.

The Commission understands that the characteristic turbid effluent from membrane systems treating wastewater may also be more difficult to disinfect with ultraviolet light, as the colour may interfere with light transmission. Although the City of Brandon stated that all effluent would be disinfected with ultraviolet light, the reports contained diagrams showing the effluent from the membrane system bypassing the disinfection system. The Commission believes that all effluent should be disinfected and this should be made a condition of the City of Brandon licence.

The Commission is also concerned about the proposed 12-month period of grace required to bring the expanded Industrial Wastewater Treatment Facility into operation. In this regard, the City of Brandon should be required to put a contingency plan into place to ensure that potential process disruptions do not result in exceedences of effluent limits or increased nutrient loadings to the Assiniboine River in excess of those allowed under the existing licence.

Industrial Wastewater Treatment Process Effluent

Representatives of North/South Consultants presented water quality information for the Assiniboine River study from Brandon to Portage la Prairie, Manitoba (Exhibit 32). The information was based on reports prepared by Earth Tech and North/South Consultants on a long-term Assiniboine River monitoring study (Exhibits 20, 33). Study objectives were to measure ammonia, oxygen and nutrients/algae prior to and during the one-shift-per-day operation of the Industrial Wastewater Treatment Facility, collect data to develop waste quality models of the Assiniboine River, and use the models to determine the cumulative impact of the various effluent discharges in the Brandon area.

The study results showed that during the winter months, ammonia levels measured in the Assiniboine River at Brandon were reduced due to a combination of dilution from groundwater and nitrification by bacteria. Ammonia inputs at Brandon caused little increase in ammonia levels

under high flow conditions during the summer. Ammonia rapidly disappeared from the surface water, and levels returned to background levels by the end of the mixing zone under summer low flow conditions. The decline was attributed to uptake by plants and algae, and nitrification by bacteria. It was concluded that the inputs of ammonia to the Assiniboine River from the Industrial Wastewater Treatment Facility after expansion are projected to be very low, and that the projected inputs are well below the assimilative capacity of the river.

The consultant suggested oxygen levels under extensive ice cover might decline over the study area. Key factors for the Assiniboine River included upstream dissolved oxygen levels, location and extent of open water, groundwater and surface springs, tributaries, river discharge, effluent effects (loads/open water), travel times, sediment oxygen demand and other river processes. Effluent inputs at Brandon did not cause a measurable change in oxygen levels under summer high flow conditions. Dissolved oxygen levels were variable under low flow conditions due to the diurnal fluctuation in oxygen levels and presence of attached algae. The effects of the expanded Industrial Wastewater Treatment Facility on biological oxygen demand and ammonia were predicted to be relatively small relative to other inputs at Brandon, and would remain comparable to current conditions. It was determined that the effects on dissolved oxygen related to nutrient loading would decrease with the expanded facility.

The consultant reported that under high summer flow conditions effluent inputs to the Assiniboine River at Brandon did not cause a measurable change in nutrient levels. However, inputs of nitrogen and phosphorus caused a marked increase in nutrient concentrations under low flow conditions. The proposed Industrial Wastewater Treatment Facility expansion was predicted to decrease nutrient loading to the Assiniboine River, particularly nitrogen, relative to inputs from the one shift operation.

The consultant went on to provide a summary of information on the effects on Assiniboine River water quality during the winter and summer. Under winter conditions, the effects from the expanded Industrial Wastewater Treatment Facility on ammonia and dissolved oxygen levels would be negligible due to low loads of ammonia and biological oxygen demand. Also, sediment oxygen demand could affect winter-dissolved oxygen but it would be reversible. During the summer, ammonia inputs would be negligible, and inputs of nitrogen and phosphorus would contribute to algal growth that could potentially exacerbate overnight declines in oxygen. Most of the effects would be confined to the mixing zone, but some might extend to the Portage la Prairie reservoir. The effects would be greater during low flow periods. Overall, it was concluded that the

proposed Industrial Wastewater Treatment Facility would reduce the impact of the effluent when compared to the present conditions.

The Westman Community Action Coalition provided a critique of the Assiniboine River monitoring study reported on by North/South Consultants (Exhibit 58). The Coalition reviewed previous concerns and discussed current criticisms including the absence of modelling information on aquatic plants and attached algae, lack of sensitivity analysis for the model, and failure to sample the same body of water as it moved downstream. The Coalition also presented results from water quality sampling and analysis for sites along the Brandon reach of the Assiniboine River (Exhibit 84). Information on temperature, conductivity, turbidity, and total and fecal coliforms was provided, and related the results to hog processing at the Maple Leaf plant. Results from sampling various effluent sources in the Brandon area were also presented.

The Coalition recommended there be no further licensing of the Industrial Wastewater Treatment Facility until completion of a consultant report to determine nutrient loading in the Brandon stretch of the Assiniboine River and to fully quantify nitrogen and phosphorus loads. It was further recommended the existing licence for the Industrial Wastewater Treatment Facility be altered to set specific concentrations for nutrients at 1 mg total phosphorus per Litre, and 4 mg total nitrogen per Litre in the summer and 8 mg total nitrogen per Litre in the winter. The Coalition also recommended that the licence require limitations on other parameters including temperature, conductivity, chloride, sodium, nitrite, nitrate, ammonia/ammonium, fecal and total coliform (measured by membrane filtration), and that there be continuous in-pipe effluent monitoring of effluent for licence parameters.

A representative of the Concerned Daly Ratepayers expressed concern about the implications of surface water contamination from hog production and the capacity of the proposed Industrial Wastewater Treatment Facility to deal with *E. coli* 157 (Exhibit 72). The representative recommended that the implications of *E. coli* 157 and *Shiga* toxins in swine be considered in relation to the design and operation of the Industrial Wastewater Treatment Facility.

The Commission heard evidence during the public hearing that the Assiniboine River is a nutrient-rich environment with significant nitrogen and phosphorus sources entering the waterway in Saskatchewan, upstream of Brandon, and in the Brandon area.

The Commission observed that effluent from the Industrial Wastewater Treatment Facility

is only monitored for a limited number of water quality parameters. While nutrient loadings are predicted to decrease, loadings for other contaminants may actually increase. In this regard, the number of parameters routinely measured in the effluent should be increased to include conductivity, heavy metals, parasites and pathogens (e.g. *Cryptosporidium, Giardia and E. coli*), organochlorines, pharmaceuticals and other parameters of concern.

It was noted that effluent limits for the Industrial Wastewater Treatment Facility are based on total loadings to the Assiniboine River rather than effluent concentration. The Commission is of the opinion that an effluent concentration approach is more appropriate for licencing, and suggests that this approach should be implemented for the expanded treatment facility after the 12-month period of grace. Proposed effluent limits are to be less than 1 mg per Litre for total phosphorus and less than 10 mg per Litre for total nitrogen all year round.

The Commission also believes that results from effluent and Assiniboine River water quality monitoring should be compiled and reported on monthly and annually, and the reports should be made available through Manitoba Conservation's public registry.

Environmental Management Systems

The Environmental Impact Assessment for the Industrial Wastewater Treatment Facility expansion stated that neither Maple Leaf Foods nor the City of Brandon have a formal Environmental Management System (Exhibit 18). However, both organizations were reported to have many of the key components of well-known environmental management systems in place. A representative of Earth Tech commented that the City of Brandon, Waste Treatment Section has developed a number of written procedures, protocols and emergency response plans which are designed to assist operators with plant operations, worker safety and environmental stewardship (Exhibit 17). The documents were reported to be in the form of general operating guidelines, communication protocols and emergency response plans.

The Earth Tech representative further reported that Maple Leaf Foods had recently updated its environmental policy, which forms the foundation of its environmental programs. It was noted that Maple Leaf undertakes systematic reviews of the environmental aspects and impacts of its operations and activities, provides environmental awareness training, defines responsibilities and accountabilities within the organization, establishes operating procedures, undertakes

environmental reviews and performs other functions typical of those found in an Environmental Management System.

A representative of Manitoba Conservation commented that proponents can be expected to develop Environmental Management Systems for their developments, and noted that requirements have been in place for some time through contingency and emergency planning. The representative confirmed that the department would be moving from an informal approach to a more formal requirement for Environmental Management Systems in the future.

A representative of Maple Leaf Foods commented that the draft Canadian Standards Association Environmental Management System standards for hog operations (Z771 and Z772) are being revised and are expected to be re-issued in the fall of 2003 (Exhibit 81). It was noted that many components of the draft standards are already in place at Maple Leaf's Elite Swine Inc. operations. The representative indicated that Maple Leaf Foods is looking closely at the Canadian Standards Association standards, but has not taken a decision respecting adoption.

A member of the Westman Community Action Coalition provided a description of the Canadian Standards Association draft Environmental Management System standards for hog operations (requirements and implementation guidance), and commented on their application from the perspective of Hog Watch Manitoba (Exhibit 55). The Coalition described the standard as a dangerous tool that should be rejected because it will place an unfair financial and human resource burden on small family farm operations, will require further legislation, and exacerbate industrialised hog operations. Other concerns were that the standards did not address air quality issues, cumulative effects analysis or the overuse of antibiotics.

Another Coalition member advocated that Maple Leaf Foods take on the responsibilities of sustainable development by pursuing ISO 14001 Environmental Management System certification before any licencing decision is made (Exhibit 95). The member argued that the ISO 14001 standard would dictate that Maple Leaf undertake a formal Environmental Management System, and subject itself to third party audits of its adherence to that system. It was argued that ISO 14001 certification would not only show the public and government that Maple Leaf Foods is a responsible corporate citizen, which everyone can have pride in, but it would also illuminate the adequacy of the environmental assessment and licencing process under *The Environment Act*.

The Coalition recommended that Maple Leaf Foods and its subsidiaries in Manitoba commit to the ISO 14001 Environmental Management System standard and establish timelines for

certification. The Coalition further recommended that the City of Brandon commit to ISO 14001 Environmental Management System certification for their wastewater systems. It was also suggested that the Danish Environmental Management System be adapted for Elite Swine and other barns under contract to Maple Leaf Foods. .

A representative of the Canadian Organic Growers mentioned that there are about 20 organic certification systems in Canada that require operators to submit an organic management plan for their livestock production (Exhibit 67). The representative explained that the plan is verified by yearly audits by independent third party inspectors contracted by the certification agency to review the paperwork and verify its accuracy by inspecting the farm or facility.

The Commission believes that an Environmental Management System is an effective tool for organizations such as Maple Leaf Foods and the City of Brandon to manage their operations in compliance with environmental legislation, establish goals and objectives, monitor and measure sustainability, and continually improve their environmental performance. It is acknowledged that Maple Leaf Foods and the City of Brandon have elements of Environmental Management Systems in place, and that Maple Leaf Foods appears to be moving towards an Environmental Management System consistent with the ISO 14001 Standard. The Commission views these actions as positive first steps towards implementing formal Environmental Management Systems.

The Commission also believes that adoption of ISO 14001 or equivalent Environmental Management Systems for regional hog production operations under Maple Leaf Foods' control will lead will lead to a higher standard of environmental performance than that required by Manitoba's present regulatory and policy framework.

Hog Processing Plant and Industrial Wastewater Treatment Facility

Surface Water

The Environmental Impact Assessment for the Industrial Wastewater Treatment Facility expansion (Exhibit 20) stated that the pre-treatment facility was designed for a peak hourly flow of 7.0 m^3 per minute (instantaneous peak flow = 10.5 m^3 per minute). The Environmental Impact Assessment (Exhibit 20) and the HDR Engineering report on the expanded Industrial Wastewater Treatment Facility (Exhibit 24) stated that the influent maximum flow is 31,200 m^3 per week and the effluent flow is 30,310 m^3 per week (@ 4,330 m^3 per day). For a 52-week year one-shift-per-

day operation, the total amount of water used by the Maple Leaf Foods hog processing plant was estimated to be about 1.6 million m^3 per year for one shift per day, and about 3.2 million m^3 per year for two shifts per day. Net water use was determined to be about 45,000 m^3 per year.

Based on information presented in the Assiniboine River Monitoring Study by North/South Consultants (Exhibit 33) using data from 1970 to 1999, the median single-day discharge of the Assiniboine River at Brandon ranged from 66.1 m^3 per second in April to 9.9 m^3 per second in September. Discharges from the Industrial Wastewater Treatment Facility were estimated to be 0.08 m^3 per second or 0.1% and 0.8% of the April and September discharges, respectively.

The Environmental Impact Assessment of the Industrial Wastewater Treatment Facility expansion did not specifically address pollution prevention initiatives or energy or water conservation strategies as mitigation measures to prevent pollution at sources and control pollution at the end of the effluent pipe (Exhibit 18). However, the assessment did outline a sustainable development strategy in which the City of Brandon and Maple Leaf Foods fully support and commit to Manitoba's principles and guidelines of sustainable development. With respect to "Efficient Use of Resources", the strategy stated that Maple Leaf Foods is continuing to study the economics of process water treatment and recycling, and the plant is designed to be as energy efficient as economically possible. A City of Brandon representative also mentioned that the City does not have a formal written water conservation plan, but water conservation elements including water-pricing mechanisms are incorporated throughout Brandon.

A representative of Manitoba Conservation stated that the provincial government is starting to address water conservation through Manitoba's *Water Strategy*. The representative noted that water quantity issues will likely be more contentious in the future and the government needs to take action accordingly. Water conservation was recognized as one way of addressing the issues and to maximize water supplies for all Manitobans. The representative explained that it has been normal practice to address water use on a site-specific basis through the licencing and assessment process. It was also noted that Canadian Food Inspection Agency regulations might limit water conservation opportunities in hog processing operations compared to other industries.

The Coalition recommended that water use be monitored throughout Manitoba, thatthe Province set in place incentives and targets for water conservation, and that pricing of water increase in communities like Brandon as the volume of water used increases. It was also recommended that there be unit pricing of water for hog operations over 250 animal units. The Coalition further requested that the parties examine a cost-benefit analysis for water reuse.

The Commission heard evidence that the amount of water used in the Assiniboine River basin is a significant issue, and that these water resources are over-allocated. Furthermore, the Prairies are experiencing drought conditions that will likely be exacerbated by the effects of climate change. While most of the water used in Maple Leaf's hog processing plant is returned to the Assiniboine River after treatment, some water is lost during processing and treatment. The Commission believes that Maple Leaf Foods and the City of Brandon should be required to undertake water audits and implement appropriate water conservation strategies. Reductions in water use in the plant are expected to result in decreased treatment costs and reduced contaminant loadings to the Assiniboine River.

The Commission also suggests that water conservation measures should be implemented within the framework of an Environmental Management System.

Groundwater

A representative of Terraprobe Limited provided information on groundwater conditions and monitoring for the hog processing plant and the Industrial Wastewater Treatment Facility (Exhibit 80). It was explained that a hydrogeological investigation of the entire site was undertaken in 1998 prior to construction and a monitoring program has been ongoing since 1998, and that annual reports have been submitted to Manitoba Conservation from 2000 to 2003. The representative discussed groundwater-monitoring results including elevated levels of nitrate (<0.2 to 285 mg/L) in an upper sand unit across the site. The results were attributed to past agricultural practices and land application of wastewater from adjacent Simplot operations. It was noted that there have been past spills of wastewater due to pipe blockages in 1999 and 2000, but no significant events in 2001 and 2002. The representative concluded that monitoring indicates no impact on groundwater as a result of operating the Industrial Wastewater Treatment Facility and the Maple Leaf Foods hog processing plant. Fluctuations in nitrate concentrations occur in all areas of the site but are not believed to be a result of site operations. Groundwater flow directions and levels were also reported to be stable and predictable.

A member of the Westman Community Action Coalition commented on groundwater concerns related to the Maple Leaf's hog processing plant and Brandon's Industrial Wastewater Treatment Facility (Exhibit 83). The Coalition member described groundwater conditions in the Brandon

region, and discussed previous geotechnical investigations at or near the hog processing and wastewater treatment sites. Concern was expressed about past spills (ammonia, wastewater) and land application practices (fertigation) in the area and at the sites, and high levels of nitrate and bacteria reported from on-site monitoring wells.

The Coalition recommended that an experienced and independent hydrogeologist be commissioned to review monitoring results from the wells around the hog processing plant and the wastewater treatment facility, and to report on the conclusions and recommendations. It was also recommended that a local resident's well should be analyzed independently four times a year for contaminants.

The Commission acknowledges the concerns expressed at the public hearing regarding the potential for groundwater contamination from the Maple Leaf Foods hog processing operation and the City of Brandon Industrial Wastewater Treatment Facility. There is potential for leaks and spills that could contaminate groundwater and nearby wells, and possibly contribute to nutrient loading of the Assiniboine River.

The Commission believes that a basic network of monitoring wells should be maintained particularly adjacent to the Industrial Wastewater Treatment Facility, the hog receiving area and the manure pad, and it should include nearby domestic wells. The number of parameters routinely measured should be increased to include pathogens and other parameters determined to be of concern. Based on the risk to the environment and human health, the Commission believes that groundwater monitoring should be carried out quarterly and the results should reported on annually through Manitoba Conservation's public registry.

Biosolids Spreading

A representative of Earth Tech provided information on the City of Brandon's biosolids management program during the hearing (Exhibit 17). Biosolids refer to the solid particles removed from the wastewater in addition to excess dead bacteria grown during biological treatment. Despite the inference in the name, biosolids are not solids and contain approximately 97% water as stated during the hearing. When applied to agricultural land under suitable conditions, the water within the biosolids drains into the soil.

The Earth Tech representative reported that the City is experienced in operating the biosolids management program, and there is no problem in obtaining owner consent for land application. Study results determined there is adequate agricultural land within a 10 km radius of Brandon, and significantly more land within a 15 km radius. It was explained that biosolids are normally hauled in the fall after the harvest is complete and before snow cover, and that some spring application is also carried out. The representative reported that the waste treatment facility produces about 489.1 dry tonnes or 16,500 m^3 of diluted biosolids each year, and that the gross area of land required for spreading is between 195 and 415.7 ha. In 2001 and 2002, the City of Brandon was reported to have spread an estimated total of 652.9 dry tonnes (17,584 wet tonnes) of biosolids (3.2% solids) on 122.8 ha.

The representative further stated that with a second shift operation and full capacity, the annual biosolids production is estimated to increase by 300% to an estimated 49,433 m^3 per year containing 3.75% solids representing a dry weight of 1,853,750 kg. Nutrient estimates for this quantity of biosolids were estimated to be 112,260 kg per year of total nitrogen and 43,850 kg per year of total phosphorus. The Earth Tech representative went on to review the terms and conditions in the City of Brandon's *Environment Act* licence for the land application for biosolids.

The Environmental Impact Assessment for the City of Brandon Industrial Wastewater Treatment Facility stated that the land application of biosolids has a positive environmental impact due to its nutrient value (Exhibit 18). No adverse environmental effects were identified with the application of biosolids to agricultural land. The assessment noted that land application of biosolids must take place in both the spring and fall, and that the City of Brandon needs to secure more land for future biosolids application. It was noted that the City expects that the current biosolids application licence will be sufficient for the first two years while hog production is increasing with the second shift operation, and the *Environment Act* licence for application of biosolids from the industrial facility will require renewal in the near future.

A Westman Community Action Coalition member presented information on solid wastes including municipal and industrial sludge and livestock manure in relation to the Maple Leaf Foods hog processing plant and the Industrial Wastewater Treatment Facility (Exhibit 85). The member discussed the City of Brandon sludge utilization program and described land application of biosolids in the Brandon region. Concerns were expressed regarding ground and surface water contamination, build-up of contaminants in the soils, release of parasites and pathogens to the environment, and ultimate enrichment of the Assiniboine River.

The Coalition recommended that the City of Brandon and Maple Leaf Foods hold separate public meetings to address the entire solid waste management program, and that a proper independent assessment be made on the demand for the product by farmers in the land zones defined for application. It was also recommended that sludge from the processing plant be subject to a complete microbiological analysis to address the issue of parasites, pathogens and antibiotics in the biosolids. The Coalition further requested that the sludge from the industrial wastewater facility be analyzed for the top 100 priority organic pollutants.

The Commission heard convincing evidence during the public hearing that the land application of biosolids from the Industrial Wastewater Treatment Facility can adversely impact surface water, groundwater and possibly human health. Based on this evidence, the Commission believes that the City of Brandon should be required to prepare annual sludge management plans for biosolids application. The management plans should demonstrate sustainability, track nutrient loadings and be audited on a routine basis. The results should also be made available to the public.

The Commission believes that the number of analytical parameters measured for biosolids should be increased to include heavy metals, parasites and pathogens (e.g. *Cryptosporidium, Giardia and E. coli*), organochlorines, pharmaceuticals and other parameters that may be contained in the waste from the Maple Leaf Foods hog processing plant. The Commission also believes that results from biosolids monitoring should be compiled and reported on annually, and the reports should be made available through Manitoba Conservation's public registry.

The Commission further believes that the City of Brandon should undertake a long-term study to determine the impact of repeated biosolids application on soils, surface water, groundwater and human health. The study should also examine nutrient build-up in existing spread fields, and determine the fate of land-applied $FeCl_2$ which is proposed to precipitate phosphorus from wastewater.

The Commission also suggests that the City of Brandon should manage its biosolids program within the framework of an Environmental Management System.

Greenhouse Gases

The Environmental Impact Assessment for the Industrial Wastewater Treatment Facility expansion provided information on greenhouse gas emissions produced by the treatment process (Exhibit 18). The assessment report stated that minor amounts of greenhouse gases may be emitted from the Industrial Wastewater Treatment Facility, and that all reasonable measures have been taken during the design to limit the amount of greenhouse gas emissions from the overall project. The measures included installation of a biogas conditioning system, and recovery of methane from the anaerobic digester and using it as fuel for the boiler. It was reported that the potential for greenhouse gases from the expanded Industrial Wastewater Treatment Facility is anticipated to be minor, with the majority being "nitrogen from the denitrification process". Other reported sources of greenhouse gases included the pre-treatment facility, operation of heavy equipment, and general vehicle traffic.

A member of the Westman Community Action Coalition presented information related to the need for a greenhouse gas inventory for the Maple Leaf hog processing plant and the City of Brandon Industrial Wastewater Treatment Facility (Exhibit 63). Sources of greenhouse gases were identified to include natural gas and methane combustion related to the anaerobic lagoons, vehicular traffic, enteric fermentation and manure, manure pad, landfilling inedible rendering, pre-treatment (solid waste, gaseous release), and sludge (dry and wet solids).

The Coalition member summarized by stating that climate change is a fact, Kyoto Protocol obligations must be met, greenhouse gas inventories are needed and carbon credit trading may benefit Manitoba.

The Commission is concerned that insufficient attention has been paid to the increase in greenhouse gas emissions from expansion of the Industrial Wastewater Treatment Facility and associated infrastructure to accommodate Maple Leaf Foods' second shift operation. In particular, the production of biogas (methane) and carbon dioxide is expected to nearly double. Maple Leaf does not have the capacity to use all of the biogas from the existing single shift operation. Flaring the biogas is a waste of this valuable energy source; consequently, additional uses for biogas should be developed.

The Commission would like to see Maple Leaf Foods and the City of Brandon conduct a complete greenhouse gas inventory of their Brandon facilities, and prepare management

plans including greenhouse gas reduction strategies and targets. This approach is consistent with Manitoba's climate change strategy.

The Commission also suggests that the City of Brandon should manage greenhouse gas emissions within the framework of an Environmental Management System.

Regional Hog Production

Biophysical Impact of Hog Production

The Environmental Impact Assessments for the Industrial Wastewater Treatment Facility expansion (Exhibit 18) and alterations to the Maple Leaf Foods hog processing facility (Exhibit 19) did not address the environmental impact of hog production in the Assiniboine River basin. The assessments only considered environmental impacts up to a 10 km radius of the development site and 120 km downstream to Portage la Prairie. Furthermore, the environmental impacts associated with intensive hog production operations and land application of biosolids and manure were not considered.

A representative of Maple Leaf Foods provided an overview of the environmental impact and sustainability of hog operations related to the Brandon hog processing plant and the second shift expansion (Exhibit 81). The relationship between Maple Leaf Foods and Elite Swine was described, and the Elite Swine project development process was explained from site selection through to hog production including manure application and monitoring. The representative presented information on manure spreading practices by Elite Swine including the use of modern technology. The representative explained Elite Swine's permit application process and procedures for filing manure management plans. The use of computerized and remotely accessed geographic information systems and global position systems to track and optimize manure applications according to nutrient management plans was also explained. The representative mentioned that Elite Swine manages some 40,500 ha over which manure is spread, and about 1,290 million Litres of nutrients over that area. It was also explained that manure storage facilities and spread fields are routinely monitored for nutrient levels in soil and groundwater. The representative further mentioned that although the company is placing a heavier focus on water conservation, it does not have a formal strategy. It was noted that the amount of manure to be spread would be lower if the amount of water used is less.

A representative of Manitoba Conservation, Environmental Livestock Program provided a description of the review process for proposed livestock operations (Exhibit 77). The

representative explained that Manitoba Conservation administers two regulations that pertain directly to livestock production operations, specifically the Livestock Manure and Mortalities Management Regulation under *The Environment Act* and the Water Rights Regulation under *The Water Rights Act*. It was explained that the Livestock Manure and Mortalities Management Regulation provides for the review and approval processes for livestock production operations. It was also explained that a permit is required to construct, modify or expand a manure storage facility, and large operations of 400 or more animal units must register a manure management plan annually. The process of issuing a permit for a manure storage facility was also described.

The representative went on to explain anticipated changes to the existing review and approval processes under the Livestock Manure and Mortalities Management Regulation and the Manitoba Water Strategy. Proper planning of livestock production operations and monitoring of performance were identified as important requirements for sustainability. Deficiencies in performance can then be used to direct corrective action at the individual farm level, or to guide adjustments to regulatory standards for the industry as a whole. The representative described enforcement activities, groundwater well monitoring and manure management plan auditing. It was concluded that "sustainability cannot be guaranteed by any single front-end action or panacea ... rather, sustainability is a work in progress that requires commitment to the concept of sustainability by all parties, and appropriate responsive tools that establish standards and monitor effectiveness".

A representative of Manitoba Conservation's Water Quality Management Section presented information on the sustainability of water quality in relation to expansion of the hog production sector in Manitoba (Exhibit 76). The representative explained that one of the main potential impacts of increased hog production is the application of manure on land and subsequent increase of nitrogen and phosphorus in surface and groundwater. It was noted that excess nutrients are one of the most important water quality issues in Manitoba's draft Nutrient Management Strategy.

The Westman Community Action Coalition discussed aquifers in southwest Manitoba and the quality of groundwater with specific reference to nitrates, coliform bacteria and *E. coli*. Concern was expressed regarding the land application of hog manure and the build-up of nitrogen and phosphorus in the soil. Reference was made to a recent report for the Manitoba Livestock Manure Management Initiative [7] on acceptable phosphorus concentrations in soils. The report noted that most of Manitoba's surface water quality data are based on periodic sampling rather than an

event basis, estimates of agricultural loading are based on inadequate information concerning export coefficients, and that nutrient retention processes are not well understood.

Coalition members expressed a number of concerns regarding the application of manure on agricultural lands including soil, surface and groundwater, and resulting well water contamination. Nitrogen and phosphorus build-up in soils and the associated contamination of groundwater and enrichment of surface waters was mentioned. Members expressed particular concern regarding the number of wells in the province that are contaminated by *E. coli* from livestock operations. The presence of pathogens and parasites that can be transmitted to humans was also a concern. The members also commented on the general absence of information on hog production operations and the lack of publicly available monitoring data.

Members of the Coalition and the public expressed concerns about the sustainability of hog production in Manitoba. The Coalition's concern related to the lack of data or sustainability indicators to measure the sustainability of the industry. It was noted that there is more to sustainability than economics of the hog production and processing industries such as the hidden costs to industry, government, communities and individuals. Members of the public commented that intensive livestock operations are not sustainable over the longer term because of the environmental, social and other impacts associated with the industry.

The Coalition endorsed recommendations of the "*Finding Common Ground*" report [(2)] as they apply to the application of manure on the basis of the total phosphorus content. The Coalition recommended the phase-out of all liquid manure systems over the next decade and that, in the interim, all liquid manure operations should immediately take steps to install groundwater-monitoring wells. The Coalition also recommended that the government of Manitoba commit to more frequent monitoring of groundwater quality in the vicinity of earthen storage structures and in areas where there is continuous surface application of sludge and manure. The Coalition requested that annual reports be presented to the Legislature and the public on the ongoing state of groundwater quantity and quality in the province.

The Coalition recommended no further expansion of the hog industry in the Assiniboine River basin until the consultant study on the Assiniboine River from the Shellmouth Dam to the City of Brandon has been completed. It was also recommended that future hog grower operations be required to be of the hoop-barn type, and that if a public subsidy program is considered for the Industrial Wastewater Treatment Facility the funds be diverted to encouraging the hoop-barn system. The Coalition went on to recommend that proponents be required to use the

sustainability indicators produced by the Manitoba Round Table to aid in the creation of their respective environmental assessment documents, and that the Manitoba Round Table attend hearings so that sustainability issues are professionally considered.

A representative of the Canadian Organic Growers provided a description of organic livestock management and outlined the problems that it can solve (Exhibit 67). Organic livestock management was defined as a holistic system of production designed to optimize the productivity and fitness of diverse communities within the ecosystem, including soil organisms, plants, livestock and people. The Canadian Organic Growers representative explained that organic production encourages composting animal manure, and minimizes nutrient leaching through building organic matter in the soil. Also, humane living conditions reduce stress so the animals do not require high levels of antibiotics to survive, and natural feeding styles build beneficial bacteria that help defend against pathogens. The representative concluded by stressing that we must work across sectors in supporting food production in a more sustainable manner, and stated that, "A sustainable food system is economically viable to all participants, is socially supportive, ecologically sound and meets the needs of future generations". The Canadian Organic Growers representative went on to describe what is needed to support more environmentally sound livestock production in Manitoba.

A member of the public expressed concern that increased hog production by 2.5 million hogs poses a significantly greater environmental problem than those already present with the high level of production in Manitoba (Exhibit 69). Known environmental hazards of hog production were identified as toxic forms of *E. coli*, antibiotic-resistant bacteria, transmission of viruses and parasites to humans, hormones and heavy metals in hog feeds, exposure to hydrogen sulphide and ammonia, and nutrient loading to rivers and lakes. Concern was expressed about potential health threats, contamination of water resources and the high cost of water treatment. The individual commented that the cost of cleaning up the problems resulting from increased hog production will likely have to be born by the taxpayer and not the polluter, and that there are other less wasteful, less polluting, and less health-threatening ways to produce hogs with straw-based composting systems.

Another member of the public discussed the manure application guidelines provided by Manitoba Agriculture and Food (Exhibit 66). He expressed concern that repeated manure applications following the guidelines can result in a surplus of phosphorus in the soil. The presenter noted that the guidelines for manure application are a licence to pollute, and recommended that the currently

used fertiliser application worksheet should be discarded. Disappointment was expressed with the government and the agriculture industry regarding historical nutrient application problems.

The Commission believes that increased production of hogs in large-scale liquid manure production operations (GT 400 animal units) is a reasonable and foreseeable consequence of adding a second shift to the Maple Leaf Hog Processing Plant. It further believes that a significant number of the hogs to be processed for the second shift will be raised in the Assiniboine River basin. It is acknowledged that nutrient loadings to the river will be reduced by modifications to the Industrial Wastewater Treatment Facility once Maple Leaf's second shift is fully operational, resulting in an improvement in river water quality. However, the extent to which this improvement could be negated by increasing hog production and its potential for degrading river water quality is unknown.

The evidence heard related to the sustainability of hog production indicates that welcomed improvements to the current large liquid waste production operations are being made, and there are intentions of making further improvements. However, based on the information presented during the public hearing the Commission is not convinced by information presented by the proponents, the public or the Government of Manitoba that hog production in Manitoba is sustainable. Adequate scientific measurements to verify the sustainability of such operations was not presented at the hearing.

The Commission believes that an opportunity exists to form a collaboration among Manitoba Agriculture and Food, the Prairie Farm Rehabilitation Administration, the Manitoba Pork Council, local and Aboriginal communities, non-government organizations and universities to examine the sustainability of modern hog production operations by collecting, analyzing and publishing relevant monitoring data. These data would include measurement of soil contaminants, parasites and pathogens, and nutrient levels on spread fields and in ground and surface waters associated with the production operations. Monitoring of surface water quality at the hog production operation property line is suggested.

The Commission further believes that production operations that use less water such as straw-based systems should be seriously investigated, given the likelihood of future drought conditions on the Prairies.

It was noted that guidance material (i.e. worksheets) provided to farmers on manure application rates can lead to a build-up of nutrients in the soil and result in ground and surface water contamination. The Commission suggests that guidance materials be verified and monitoring procedures put into place to prevent the accumulation of nutrients in agricultural soils.

The Commission encourages use of the principles and guidelines for sustainable development prescribed in Manitoba's *Sustainable Development Act,* and recommends that specific indicators be developed to assess the sustainability of hog production.

Socio-Economic Impact of Hog Production

The Environmental Impact Assessments for the Industrial Wastewater Treatment Facility expansion (Exhibit 18) and the hog processing plant alteration (Exhibit 19) did not address the socio-economic impact of hog production in the Assiniboine River basin. The assessments considered direct social and economic impacts up to a 10 km radius of the development site and 120 km downstream to Portage la Prairie.

A representative of Maple Leaf Foods provided information on the environmental impact and sustainability of hog operations related to the second shift expansion at the Brandon plant (Exhibit 81). The representative noted that there was a 65% increase in Manitoba's hog production measured in animal units from 1991 to 2001. The representative described the economic benefits of swine production using one 6,000 sow production model to include 46 jobs ($1.3 million in salaries), $32 million in investment, $21 million in building construction and labour, $90 thousand in taxes, and 1.6 million bushels of grain consumption. One 6,000-sow production operation was reported to result in 186 direct jobs. The representative went on to describe where the existing 54,000 hogs per week come from in Manitoba, Saskatchewan and Alberta, and where the additional 54,000 hogs per week would come from. It was explained that more than 70% of the piglets required to produce the hogs for the second shift are already in production but some are currently being fed out in the United States. This leaves 15,500 hogs per week to be incorporated into the Manitoba production system. This number equated to approximately 36 sites at 4 barns per site.

A representative of Maple Leaf Foods submitted a letter from the Southwest Region of the Manitoba Métis Federation to the Commission (Exhibit 82) expressing support for Maple Leaf Foods' second shift operation, and gratitude for the support provided by Maple Leaf to the local

community. The representative stated that Maple Leaf has proven itself to be a pillar of the community and a good corporate citizen, actively contributing to various local programs and initiatives.

A member of the Westman Community Action Coalition presented information on labour economics and workforce implications of increased hog production in the Brandon area (Exhibit 68). The member described the meatpacking industry as having large-scale production, low wages, high turnover and employment volatility. It was explained that the industry has been unable to make significant increases in productivity through automation, and has come to rely on a combination of fast line speed and low wages. The addition of a second shift was predicted to trigger problems such as higher rates of turnover and increased injuries and absenteeism.

The Coalition member commented that the meatpacking industry is extremely price-sensitive and there is no reason to believe that the second shift will not be severely disrupted by high hog prices and poor margins in the future. The high rate of worker turnover may mean a reliance on workers from out of the province. The member also noted that since income and social status are determinants of environmental health, there are significant health risks associated with large-scale hog production operations.

The Coalition member concluded there are important legislative and policy steps that can be taken by the provincial government to protect the affected workers. He noted, however, that there would continue to be strong pressure in a direction that is neither safe nor healthy for the workers nor the environmental health of the community. The individual recommended that agriculture workers be included under workers compensation legislation, worker majorities on health and safety committees should be legislated, and governments should require employers to report health and safety training activities.

A member of the Coalition also commented that Maple Leaf Foods and the City of Brandon have not produced an adequate socio-economic assessment of the entire development (Exhibit 95). The member contended that the documents should have been produced to begin with and brought under public scrutiny at the beginning of the hearing. It was also noted that the matter of increased intensive hog production in Manitoba has not been fully assessed.

The Coalition recommended that the City of Brandon and the provincial government commission an independent, interdisciplinary cost/benefit analysis on the impact of the first shift operation at Maple Leaf Foods, that the impact of the first shift operation on social conditions be quantified

and that this information updated on a regular basis if a second shift proceeds. It was also requested that any "Memorandum of Understanding" between the proponent(s) of a major development and the government or any other public body should be a public document.

A member of the public identified problems facing rural communities that must be considered in a proper socio-economic impact assessment of the proposed Maple Leaf Foods second shift operation and consequent hog production increase (Exhibit 71). The individual spoke on how it is difficult to balance environmental, ecological, economic, political and social needs of a community in a sustainable way, and explained that building of the first phase of the Maple Leaf plant has had negative effects on rural Manitoba. Concern was expressed that the expansion plan would serve to further exacerbate these negative effects.

The individual went on to discuss economic activity in Manitoba in terms of Gross Domestic Product, and noted that such activity does not measure how resources are distributed for the benefit of all citizens. The basic assumption that development means growth was challenged, and it was noted that the planet has a limited capacity to absorb the output from such growth. The individual suggested that development can and should take into consideration strategies for developing economies that meet the needs of existing communities in a manner that sustains people.

A representative of the Concerned Daly Ratepayers expressed concern about the socio-economic and environmental impacts of the expansion of the Maple Leaf Foods hog processing plant in Brandon and intensive livestock operations in rural Manitoba (Exhibit 72). It was suggested that while the expansion of hog production in Manitoba may be technically feasible, the initiative is neither economically viable nor ecologically sound. The representative commented that the City of Brandon and the Province of Manitoba have provided a substantial subsidy to the Maple Leaf Foods operation, and referred to an agreement between Maple Leaf and the City of Brandon and elimination of single desk selling by the Pork Marketing Board. It was also noted that the expansion of intensive livestock operation hog production is only economically viable in the presence of social subsidization, with the ultimate beneficiary being Maple Leaf Foods.

The Ratepayers representative also spoke about the costs to municipalities associated with intensive livestock expansion. These are costs related to remediation of contaminated groundwater, demise of the family farm economy and destruction of the rural community. The representative recommended that a comprehensive socio-economic impact assessment should

be conducted that identifies social costs to rural communities and the attendant costs to both urban and rural taxpayers before approval of the Maple Leaf Foods proposal is granted.

Conflicting information presented by the public and the proponents on socio-economic, cultural and health impacts of the Maple Leaf Foods and City of Brandon proposals limited the Commission's ability to provide meaningful advice on these important matters. Accordingly, the Commission believes that follow-up programs should be carried out to verify the accuracy of the proponent's assessment of socio-economic impacts, and to ensure that mitigation measures are implemented that are appropriate and effective.

Cumulative Impact of the Developments

The Environmental Impact Assessments for the Industrial Wastewater Treatment Facility expansion (Exhibit 18) and the hog processing plant alteration (Exhibit 19) did not assess the cumulative impact of the wastewater treatment facility and the hog processing plant in combination with the impacts of other developments in the Brandon area or Assiniboine River basin. The assessments considered environmental, socio-economic and other impacts separately but not in combination with each other or with those of other developments.

The Advice Document for the Environmental Impact Assessment (Exhibit 9), as prepared by Manitoba Conservation, provided guidance to the City of Brandon on cumulative environmental effects. This document called for an assessment of the total cumulative effect of the development, and not just the incremental additional amount that would result from the two-shift-per-day production proposal. It also required that any impacts on the receiving waterway, due to the release of any identified pollutants, should be assessed by addressing the cumulative effects of pollutant releases upon the ecology and downstream uses of the receiving waterway.

A representative of North/South Consultants presented information on the Assiniboine River Water Quality Study objectives (Exhibit 33). One such objective was to use water quality data to develop models for the Assiniboine River that consider the cumulative impact of effluent sources in the Brandon area including the Brandon municipal wastewater treatment facility and the Simplot Canada fertilizer plant. However, reports on the Assiniboine River Water Quality Study did not provide an adequate analysis or conclusions regarding cumulative environmental effects (Exhibits 20, 33).

A member of the public commented that Maple Leaf Foods is planning to concentrate production in a 6,587,386 ha area of which 20% is reported to be unavailable for manure spreading due to setbacks from watercourses (Exhibit 71). It was noted that people live in the area, and beef cattle, dairy cattle, sheep, poultry and other forms of livestock occur in the area. The individual went on to state that the cumulative impact of increased manure production, and the ability of other types of livestock production to proceed in the future, must be taken into consideration.

The same individual commented on the potential cumulative impacts of increased hog production on the Assiniboine River both upstream and downstream from the Maple Leaf plant. Concern was expressed that increases in nitrogen and phosphorus loadings upstream would impact the degree of permissible discharge from the proposed wastewater treatment facility. The individual requested that the cumulative impact be taken into account so that the ecological integrity of the Red and Assiniboine rivers is not compromised further.

A representative of the Concerned Daly Ratepayers expressed concern about the cumulative effects on rural water resources that are associated with over-development and high concentrations of industrial hog production facilities in the Assiniboine River basin (Exhibit 72). The representative recommended that a comprehensive assessment of the effects on Assiniboine River water quality and upstream and downstream river uses is required before any approval is granted. Particular concern was expressed about the implications of increased ground and surface water usage, and the effects of manure spreading on surface and ground water quality by the proposed expansion of intensive livestock production facilities.

The Commission is concerned that Maple Leaf Foods and the City of Brandon did not undertake a proper cumulative effects assessment of the developments as specified in Manitoba Conservation's "Advice Document". An assessment of cumulative effects would, by definition, have addressed the regional impact of increased hog production in the Assiniboine River basin and resulted in a more coordinated approach to assessing the sustainability of the development. Such assessments typically require cooperation among other proponents, regional authorities and government in the identification, mitigation and follow-up of cumulative effects over larger areas and time scales.

The Commission strongly urges Manitoba Conservation to provide guidance and best practice procedures to proponents respecting the conduct of cumulative effects assessments so that the results may be taken into account during the licencing process.

Environmental Monitoring

The Environmental Impact Assessment for the Industrial Wastewater Treatment Facility expansion (Exhibit 18) outlined environmental monitoring currently undertaken at the site, and proposed monitoring during construction and operation of the expanded wastewater facility. Monitoring was reported to be carried out on influent and effluent volumes and quality, receiving (Assiniboine River) water quality, and groundwater flow, direction and quality. For the most part, environmental monitoring appeared to be undertaken in relation to *Environment Act* licence requirements. No emissions testing or air quality monitoring has been carried out for the wastewater treatment facility and hog processing plant. A future environmental monitoring program was not provided for in the environmental impact assessment documents.

Members of the Westman Community Action Coalition commented that there is inadequate monitoring of hog production operations and wastewater discharges into the Assiniboine River. It was reported that improved monitoring was required to assess the sustainability of hog production. Coalition members also criticized the nature and extent of monitoring associated with the Assiniboine River assimilative capacity and the in-stream flow requirements studies. Concern was expressed that other constituents (i.e. heavy metals, endocrine disrupting substances, pharmaceuticals) and pathogens (i.e. *E. coli, Cryptosporidium and Giardia*) in the effluent from the Industrial Wastewater Treatment Facility are not tested on a routine basis. The Coalition also noted that licence requirements are inadequate and suggested that temperature, conductivity, chloride, sodium, nitrite, nitrate and other parameters should be monitored routinely in the receiving environment.

A representative of Maple Leaf Foods mentioned that monitoring is carried out at all Elite Swine hog operations for surface water, groundwater, manure application, nutrient loading, etc. It was mentioned that monitoring is carried out remotely using computer and geographic positioning system technology, and data are compiled in a geographic information system database.

A consultant to Maple Leaf Foods presented information on groundwater monitoring in relation to the Maple Leaf hog processing plant and the City of Brandon Industrial Wastewater Treatment Facility (Exhibit 80). The consultant explained that over 50 monitoring wells were installed in 1998-99 with monitoring of water levels monthly and water quality every three months. Data loggers were also installed at selected wells to allow daily monitoring of water levels. The number of monitoring wells was reduced to 44 in 2001-02 (semi-annual monitoring) and to 18 in 2003

(annual monitoring). The consultant concluded that there was no impact to the groundwater as a result of either the Industrial Wastewater Treatment Facility or the hog processing plant.

A member of the public commented that without monitoring one does not know what and where the contaminants or hazards are, their severity and the most vulnerable populations in various regions, and without adequate enforcement the regulations are "a mockery" (Exhibit 69). The individual commented that there is scepticism about the effectiveness of regulations and guidelines, and the amount or frequency of inspections, and the effectiveness of enforcement. It was noted that provincial governments have permitted hog production operations in areas that are particularly vulnerable to contamination of water sources including aquifers, and there are hog operations in places with high water tables and risk of flooding and drainage into watercourses. The individual went on to suggest that the provincial government does not have sufficient staff or resources to meet existing needs.

The Commission observed that Manitoba Conservation, Maple Leaf Foods, Elite Swine and the City of Brandon appear to possess environmental information from their respective monitoring programs. However, it was evident that much of this information is not available to the public. The Commission would like to see this information compiled and reported on annually, and placed in Manitoba Conservation's public registry.

The number of parameters measured by environmental monitoring programs appears to be generally limited, and there are other parameters of concern that should be monitored on a routine basis. The Commission believes that surface water, groundwater and soil monitoring programs should involve periodic screenings for a wider range of environmental contaminants (i.e. Can*adian Environmental Protection Act* Priority Substances) in addition to analysis for parasites and pathogens (e.g. *Cryptosporidium, Giardia and E. coli*), organochlorines, pharmaceuticals and other parameters determined to be present in Maple Leaf's wastewater.

Manitoba Conservation's intention to establish additional water quality monitoring stations along the Assiniboine River is supported by the Commission. Comprehensive water quality information is required for effective management of the Assiniboine River basin. Manitoba Conservation should also be required to establish baseline conditions for the Assiniboine River.

The Commission further suggests that Maple Leaf Foods and the City of Brandon should undertake the required environmental monitoring and reporting within the framework of an Environmental Management System.

Assiniboine River In-stream Flow Requirements

The *Terms of Reference* for the Commission's review of the Industrial Wastewater Treatment Facility expansion included the potential environmental impacts of the construction and operation of the proposed expansion of the Industrial Wastewater Treatment Facility on the minimum in-stream flow needs of the Assiniboine River, as well as the projected withdrawal of water from the river to satisfy the requirements of the hog processing plant under a two-shift-per-day operation (Exhibit 2). Minimum in-stream flow conditions were reported to be required to ensure the ecological integrity of provincial watercourses.

A representative of Manitoba Conservation presented an update on the Assiniboine River In-stream Flow Study (Exhibit 34). The representative discussed the objective of the study, which was to define an instream flow regime that provides for intra- and inter-annual flow variability to ensure sufficient flowing water to sustain aquatic life and terrestrial biota production, riverine functions and processes at any time. The five components to the study are hydrology, geomorphology, connectivity, biology, and water quality.

The Manitoba Conservation representative noted that consumptive use of Assiniboine River water is increasing with increased irrigation use and the Simplot Canada Ltd. potato processing plant in Portage la Prairie. The area irrigated in the region has increased 89% from 1999 to 2004. It was also explained that the amount of water that can be allocated is based on the instream flow reservation of 100 cfs for Brandon and 200 cfs for Portage la Prairie. These reservations address municipal sewage dilution requirements but not ecosystem or biotic community needs.

The representative discussed the Instream Flow Committee, which has membership from Manitoba Conservation, Fisheries and Oceans Canada and the University of Manitoba. It was explained that fish, land and water are provincial Crown resources and that fish habitat is under federal jurisdiction. The representative mentioned that there are draft instream flow recommendations for St. Lazare and Brandon that need to be finalized. Work remaining includes transferring instream flow recommendations results to remaining sites, assessing the regime in terms of allocation and the Shellmouth Reservoir, and reconciling results from water quality

studies. The Instream Flow Committee has to meet to address these recommendations. A date for completion of the Assiniboine River Instream Flow Study could not be provided.

The Westman Community Action Coalition recommended that there be no further expansion of the hog industry in the Assiniboine River basin and no licensing of the Industrial Wastewater Treatment Facility be considered until completion of the Assiniboine River in-stream flow requirements study. The Coalition also recommended that the Province of Manitoba renew the mandate of the Assiniboine River Advisory Board with directions to address issues of water apportionment, dam regulation and water quality improvement.

The Commission was not able to address this issue satisfactorily during the hearing because the Assiniboine River instream flow requirements study is not complete and it is unclear when the study will be available. The impact of increased water withdrawal from the Assiniboine River as a result of Maple Leaf Foods' second shift and the impact of more large liquid-based hog barns on regional aquifers and on the river itself can only be properly determined if the results from the in-stream flow study are available. The information is critical for the future management of the Assiniboine River in relation to current and future development proposals, and to the effects of climate change. Accordingly, the Commission requests that Manitoba Conservation be directed to complete the study as soon as practically possible, and ensure that the report and supporting documentation is made available to the public.

Observations

The following observations are provided as general comments or suggestions to government resulting from the public hearing on the Maple Leaf Foods' hog processing plant and the City of Brandon's Industrial Wastewater Treatment Facility. They are presented as matters of importance or concern, which warrant consideration by government.

Environmental Impact Assessment Report

The Commission observed that environmental assessment documentation provided by the proponents for the hog processing plant alteration and the Industrial Wastewater Treatment Facility expansion did not fully satisfy all the requirements of Manitoba Conservation's "Advice Document" and did not conform to environmental assessment best practice. Consequently, the Commission was not fully able to provide meaningful advice and recommendations on the impact of the proposals on the environment.

The Commission is of the opinion that improved environmental impact assessment documents resulting from higher standards, improved guidance and stricter quality control by Manitoba Conservation will lead to a more efficient and effective public hearing process, and result in more complete recommendations by the Commission.

Aboriginal Involvement

The Commission observed that Maple Leaf Foods and the City of Brandon did not undertake meaningful communications with Aboriginal communities as part of the environmental assessment on the proposed developments. Environmental assessment documentation did not appear to be made available to Aboriginal communities in the region. Manitoba Conservation's "Advice Document" was very specific about contacting First Nation communities who may be affected by or concerned about the proposed development. The Commission considers such contact critical to the environmental assessment process, and suggests that Manitoba Conservation, with the advice of Assembly of Manitoba Chiefs, tribal councils and the Federal Government, prepare a checklist for proponents with procedural guidance to facilitate meaningful communication with Aboriginal communities during the environmental assessment process. Additionally, a protocol should be developed to ensure that environmental assessment documentation is provided to Aboriginal communities.

Recommendations

A. Licencing

1. **Manitoba Conservation should issue *Environment Act* licences to Maple Leaf Foods Inc. for an alteration to its Brandon hog processing plant and the City of Brandon for an expansion of its Industrial Wastewater Treatment Facility. The licences should be reviewed by Manitoba Conservation one year after the expanded wastewater treatment facility is put into operation for adherence to the terms and conditions.**

The Commission concluded that adequate information was provided at the public hearing to issue licences for the Maple Leaf Foods hog processing plant and the City of Brandon Industrial Wastewater Treatment Facility. However, the Commission believes that the licences should be reviewed one year after commissioning the wastewater treatment facility to determine if the Zenon membrane system meets the design criteria and achieves the predicted effluent quality. The review should also determine whether the terms and conditions of the licences have been implemented and whether they are proving effective in protecting the environment. Reports on the reviews should be placed in the Public Registry.

B. Licence Terms and Conditions

2. **The licence limits for nutrients in the effluent from the City of Brandon Industrial Wastewater Treatment Facility should be set at 1 milligram per Litre for total phosphorus and less than 10 milligrams per Litre for total nitrogen for the entire year.**

The Commission is of the opinion that an effluent concentration approach is appropriate for licencing Brandon's Industrial Wastewater Treatment Facility, and believes that this approach should be implemented after the proposed 12-month period of grace. The effluent limits recommended are well within those reported from pilot testing of the Zenon membrane system and are consistent with limits in place for other major cities in western Canada. The Commission also recommends that the City of Brandon be required to put a contingency plan in place during the period of grace to ensure that process disruptions do not result in increased loadings to the Assiniboine River above those currently licenced.

3. **The licence for the City of Brandon Industrial Wastewater Treatment Facility should include a requirement for the City of Brandon to secure a performance guarantee and letter of credit or bond from the supplier of the treatment**

system to ensure that effluent limits are achieved and Brandon and Manitoba taxpayers are protected.

The Commission acknowledges the City of Brandon's proposal to achieve a higher standard of effluent quality from the Industrial Wastewater Treatment Facility. However, the Commission remains concerned that the limited pilot testing of the Zenon membrane filtration system may not have identified all potential operational problems. High membrane replacement and operating costs could result in significant costs to Brandon and Manitoba taxpayers. The Commission believes that this concern would be addressed by Zenon providing a performance guarantee or posting a letter of credit to cover any unforeseen costs.

4. **Maple Leaf Foods and the City of Brandon should be required to immediately begin development and implementation of ISO 14001-certified Environmental Management Systems for their respective hog processing and industrial wastewater treatment facilities, and complete their Environmental Management Systems by December 2005.**

An Environmental Management System is an effective tool for organizations such as Maple Leaf Foods and the City of Brandon to manage their operations in compliance with environmental legislation, to establish goals and objectives, to monitor and measure sustainability, and to continually improve environmental performance. The Commission acknowledges that Maple Leaf Foods and the City of Brandon have taken actions to implement components of Environmental Management Systems but recommends that they proceed to ISO 14001 certification. It is also noted that other large corporations such as IBM, Xerox, McDonald's and Ford have implemented ISO 14001-certified Environmental Management Systems with positive environmental, social and economic results.

5. **Maple Leaf Foods should be required to establish Environmental Management Systems consistent with the ISO 14001 Standard for hog production operations in Manitoba under its control by December 2005 and should encourage Environmental Management Systems for its suppliers.**

In accordance with the ISO 14001 Environmental Management System Standard, Maple Leaf Foods should extend the management system to its activities, products and services that it can control and over which it can be expected to have an influence. This includes hog production operations such as Elite Swine that supply the Maple Leaf plant. The Commission believes that Environmental Management Systems will "raise the bar" by promoting a higher standard of environmental performance than that provided by Manitoba's present regulatory and policy framework.

6. **Within 12 months of receiving Environment Act Licences, both Maple Leaf Foods and the City of Brandon should be required to complete water audits of their respective hog processing and industrial wastewater treatment facilities, and prepare water conservation plans with strategies and targets for reducing water use.**

Since Maple Leaf's second shift operation will result in increased water use, the Commission believes that Maple Leaf Foods and the City of Brandon should be required to undertake water audits and implement appropriate water conservation strategies. Reductions in water use are expected to result in decreased treatment costs and reduced contaminant loading to the Assiniboine River.

7. **Maple Leaf Foods and the City of Brandon should be required to conduct quarterly groundwater monitoring at high risk locations adjacent to their respective hog processing and industrial wastewater treatment facilities.**

There remains the potential for leaks and spills that could contaminate groundwater and nearby wells and possibly impact the Assiniboine River. The Commission determined that locations at risk for groundwater contamination such as the hog receiving area, manure pad, and wastewater treatment facility as well as nearby residences should be monitored quarterly and reported on annually. Information from groundwater monitoring should be placed in the Public Registry.

8. **The City of Brandon should be required to prepare sludge management plans for the land application of biosolids from its Industrial Wastewater Treatment Facility. The management plans should be updated annually, audited on a routine basis and be made accessible to the public.**

The Commission believes that the City of Brandon should prepare annual sludge management plans for biosolids application. The management plans should demonstrate sustainability, track nutrient loadings and be audited on a routine basis. The Commission further believes that the City of Brandon should undertake a long-term study to determine the impact of repeated biosolids application on soils, surface water, groundwater and human health. The study should examine nutrient build-up in existing spread fields, and determine the fate of $FeCl_2$ that the City of Brandon proposes to use in its expanded facility to precipitate phosphorus from wastewater.

9. **Within 12 months of receiving Environment Act Licences, both Maple Leaf Foods and the City of Brandon should be required to complete greenhouse gas inventories of their respective hog processing and industrial wastewater treatment facilities and prepare greenhouse gas management plans with reduction strategies and targets.**

The Commission is concerned that the production of greenhouse gases including methane (biogas) is expected to nearly double with the second shift operation. Maple Leaf does not have the capacity to use all of the biogas from the existing single shift operation, and flaring the biogas is a waste of this valuable energy source. The Commission would like to see Maple Leaf Foods and the City of Brandon conduct a complete greenhouse gas inventory of their hog processing and industrial wastewater treatment facilities, and prepare management plans including greenhouse gas reduction strategies and targets.

10. **The City of Brandon should be required to increase the number of parameters measured in effluent from the Industrial Wastewater Treatment Facility to include conductivity, heavy metals, parasites and pathogens (e.g. *Cryptosporidium, Giardia and E. coli*), organochlorines, pharmaceuticals and other parameters determined to be of concern from periodic effluent screening.**

It was observed that the number of parameters measured in the effluent from the Industrial Wastewater Treatment Facility is limited and there are other contaminants that should be monitored on a routine basis. The Commission believes that there should be periodic screenings of the effluent for a wider range of environmental contaminants (i.e. *Canadian Environmental Protection Act* Priority Substances) in addition to the other parameters determined to be of concern. Monthly monitoring reports should be placed in the public registry for the treatment facility.

C. Other Matters

11. **Manitoba Conservation, in cooperation with Manitoba Agriculture and Food, the Prairie Farm Rehabilitation Administration, the Manitoba Pork Council, local and Aboriginal communities, non-government organizations and universities should oversee a study to examine the sustainability of hog production in the Assiniboine River basin, develop sustainability indicators, and report on the study to Manitobans by December 2005 with an interim report due December 2004.**

Based on the information presented by the proponents, the public and the Government of Manitoba during the hearing, the Commission is not convinced one way or the other that hog production in relation to the Maple Leaf plant is sustainable. Adequate scientific data to verify the sustainability of hog production operations was not presented. However, the Commission believes that an opportunity exists to form a collaboration among Manitoba Conservation, in cooperation with Manitoba Agriculture and Food, the Prairie Farm Rehabilitation Administration,

the Manitoba Pork Council, local and Aboriginal communities, non-governmental organizations and universities to examine the sustainability of modern hog production operations by collecting, analyzing and publishing relevant monitoring data.

12. Manitoba Conservation should establish additional monitoring stations along the Assiniboine River to ensure that adequate water quality data are available for planning and management decisions in the basin.

The Commission fully supports Manitoba Conservation's proposal to establish additional water quality monitoring stations along the Assiniboine River. Stations should be established above and below the City of Brandon. They should be monitored at least monthly for a full range of water quality parameters including heavy metals, nutrients, parasites and pathogens and other parameters determined to be of concern from screening point and area sources.

13. Manitoba Conservation should be directed to complete and report on the Assiniboine River in-stream flow requirements study by March 2004. Consideration should be given to the establishment of a cooperative watershed planning initiative to provide long-term environmental stewardship for the Assiniboine River basin.

The Commission was disappointed that it was not able to address this issue satisfactorily during the hearing because the Assiniboine River instream flow requirements study is not complete and it is unclear when the study will be available. The information is considered to be critical for the future management of the Assiniboine River in relation to current and future development proposals, as well as to the impact of climate change. Accordingly, the Commission requests that Manitoba Conservation be directed to complete the study as soon as practically possible, and ensure that the report and supporting documentation is made available to the public.

References Cited

(1) Manitoba Agriculture. 1988. Farm Practices Guidelines of Hog Producers in Manitoba. Prepared by the Agricultural Guidelines Development Committee. 130p.

(2) Livestock Stewardship Commission. 2000. Finding Common Ground. Report Prepared for the Government of Manitoba. 72p.

(3) Manitoba. 2002. Manitoba Water Quality Standards, Objectives, and Guidelines.Final Draft for Additional Review and Comment. Manitoba Conservation Report 2002-11:76p.

(4) Manitoba Conservation. 2000. Development of a Nutrient Management Strategy for Surface Waters in Southern Manitoba. Manitoba Conservation Information Bulletin 2000-02E:10p.

(5) Manitoba Government News Release. Province Announces Lake Winnipeg Action Plan. February 18, 2003.

(6) Manitoba. 2003. The Manitoba Water Strategy. 28p.

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Appendix A

Terms of Reference

Background

On March 19, 2003, Manitoba Conservation received an Environment Act Proposal from the City of Brandon for alterations to their existing Industrial Wastewater Treatment Facility (IWWTF) and a Notice of Alteration from Maple Leaf Foods Inc. for alterations to their existing hog processing plant in Brandon, both having been submitted to facilitate a 2-shift per day operation of the hog processing plant.

Mandate of the Hearings

The Clean Environment Commission shall conduct a public hearing to consider the Proposal and to receive public comments and concerns respecting the Proposal. Following the public hearing the Clean Environment Commission shall provide a report to the Minister of Conservation pursuant to Section 7(3) of The Environment Act on or before September 1, 2003. The Commission may, at any time, request that the Minister of Conservation review or clarify these *Terms of Reference*.

Scope of the Review

The Clean Environment Commission is to consider the Proposal and public concerns, and provide a recommendation on:

- whether a revised Environment Act Licence should be issued to the City of Brandon for the proposed alterations their IWWTF.

Should the Commission recommend the issuance of a revised Licence to the City of Brandon, then appropriate recommendations should be included in the report respecting:

- the potential environmental impacts of the construction and operation of the proposed alterations to the IWWTF on the:
  - biophysical environment;
  - quality of the water and downstream uses of the Assiniboine River; and
  - the minimum instream flow needs of the Assiniboine River as a result of the projected withdrawal of water from the river to satisfy the requirements at the hog processing plant under a 2-shift per day operation mode;
- socioeconomic, social, cultural and health impacts directly related to the environmental impacts of the Proposal;
- measures proposed to mitigate any adverse impacts resulting from the Proposal and where appropriate, to manage any residual adverse effects; and
- future monitoring and research that may be recommended in relation to the Proposal.

The Clean Environment Commission's recommendations shall incorporate, consider and directly reflect, where appropriate, the Principles of Sustainable Development and Guidelines for Sustainable Development as contained in *Sustainable Development Strategy for Manitoba*.

Appendix B

List of Registered Presenters

Name	Organization
Adam, Ken	Earth Tech Consultants Inc.
Baron, Alan	Private
Beck, Al	Manitoba Conservation
Bowen, Paul	Terraprobe Limited
Briscoe, Barry	Environment Canada
Burns, Vicki	Winnipeg Humane Society
Cooley, Megan	North South Consultants Inc.
Cornock, Mona	Manitoba Conservation
Cullen, Barry	Brandon Chamber of Commerce
Dalmyn, Ron	The Organization
Dickson, Andrew	Manitoba Agriculture and Food
Dolecki, Joe	Concerned Daly Ratepayers Inc.
Gibson, Janine	Canadian Organic Growers/Organic Food Council of Manitoba
Hayhurst, Chris	Simplot Canada Ltd.
Hebert, Patricia	MFL Occupational Health Centre
Hunt, Joe	Manitoba Conservation
Koroluk, Glen	Westman Community Action Coalition
Le Blanc, Steve	Maple Leaf Foods Inc.
Mangat, Sunny	Earth Tech Consultants Inc.
McKernan, Mike	TetrES Consultants Inc.
Moche, Clem	Manitoba Conservation
Novachis, Lawrence	Zenon Environmental Inc.
Novek, Joel	Private
Paton, Bill	Westman Community Action Coalition
Pryzner, Ruth	Private
Rogosin, Alfred	Private
Sawatsky, Ed	Manitoba Intergovernmental Affairs
Scarth, Todd	Canadian Centre for Policy Alternatives
Schneider, Adam	Westman Community Action Coalition
Schnieder, Paul	Elite Swine Ltd.
Schnieder-Vieira, Frederike	North South Consultants Inc.
Sneed, Willis	HDR Engineering Inc.
Snure, Ted	City of Brandon
Stefaniuk, John	City of Brandon (Counsel)
Strachan, Larry	Manitoba Conservation
Tennier, Ann	Maple Leaf Foods Inc.
Tessier, Sylvio	Manitoba Conservation
Williamson, Dwight	Manitoba Conservation
Zaniewski, Kamil	Westman Community Action Coalition

Appendix C

List of Exhibits

No.	Description
1.	*Letter* dated March 24, 2003 from the Honourable Steve Ashton, Minster of Conservation, to Terry Duguid, Chairman of the Clean Environment Commission.
2.	"Terms of Reference for Clean Environment Commission Hearing on the City of Brandon Proposal".
3.	""BDN/MLM Scoping Argument Discussion Points". Submitted by Larry Strachan, Manitoba Conservation.
4.	*Letter*, dated June 12, 2003, from the Honourable Steve Ashton, Minister of Conservation, to Ron Dalmyn. Submitted by Bill Paton, Westman Community Action Coalition.
5.	"Large Scale Hog Production and Processing: Concerns for Manitobans - Commissioners' Report on the Citizens' Hearing on Hog Production and the Environment, Brandon, Manitoba, October 1999". Canadian Centre for Policy Alternatives. May 2000. Submitted by Bill Paton, Westman Community Action Coalition.
6.	*Letter*, dated November 30, 2001 from Jim Vollmershausen, Environment Canada, to Norm Brandson, Manitoba Conservation. Submitted by Bill Paton, Westman Community Action Coalition.
7.	*Brief*, untitled, submitted by Adam Schneider, Westman Community Action Coalition.
8.	"Manitoba Clean Environment Commission Notice of Public Hearing: City of Brandon Industrial Wastewater Treatment Facility". Submitted by John Stefaniuk, City of Brandon (Counsel).
9.	"Advice Document for the Preparation of an Environmental Act Proposal and Environmental Assessment for an Alteration to the City of Brandon's Industrial Wastewater Treatment Facility". Submitted by John Stefaniuk, City of Brandon (Counsel).
10.	*Environment Act Licence* No. 2311 S2 R: August 20, 1999 and March 14, 2002 (Revised) "Maple Leaf Foods Inc. (Licencee)". Submitted by John Stefaniuk, City of Brandon (Counsel).
11.	*Environment Act Licence* No. 2506: May 16, 2001 "The City of Brandon (Licencee). Submitted by John Stefaniuk, City of Brandon (Counsel).
12.	*Environment Act Licence* No. 2367 S2 R: August 20, 1999 and March 14, 2002 (Revised) "City of Brandon (Licencee)". Submitted by John Stefaniuk, City of Brandon (Counsel).
13.	*Decision:* "Swampy Cree Tribal Council v. Manitoba (Clean Environment Commission)". Hirschfield, J., Manitoba Court of Queens Bench. July 18, 1994. Submitted by John Stefaniuk, City of Brandon (Counsel).
14.	"Submission to the Clean Environment Commission Hearing: City of Brandon Expansion of IWWTF for Maple Leaf Pork's Second Production Shift". Manitoba Conservation, Environmental Approvals. Submitted by Clem Moche, Manitoba Conservation.
15.	"Industrial WWP History of Licence Excursions: September 1999 - April 2003". City of Brandon Municipal & Industrial Wastewater Facilities". Submitted by Ted Snure, City of Brandon.
16.	*Curriculum Vitae*: Kenneth M. Adam. Submitted by Kenneth Adam, Earth Tech Consultants Inc.
17.	*Visual Projections (Slides):* "City of Brandon IWWTF Licence Application Summary". Submitted by Kenneth Adam, Earth Tech Consultants Inc.
18.	"Manitoba Environment Act Proposal Form and Supporting Documentation for an Operating Licence for the City of Brandon's Expanded Industrial Wastewater Treatment

No.	Description
	Facility for Maple Leaf Pork's Second Shift, Brandon, Manitoba". Earth Tech Canada Inc. March 2003. Submitted by Kenneth Adam, Earth Tech Consultants Inc.
19.	"Notice of Alteration to Accommodate the Second Shift at Maple Leaf Pork, Brandon, Manitoba". Earth Tech Canada Inc. March 2003. Submitted by Kenneth Adam, Earth Tech Consultants Inc.
20.	"Industrial Wastewater Treatment Facility Expansion Water Quality Assessment Supplemental Information to: Manitoba Environment Act Proposal Form and Supporting Documentation for an Operating Licence for the City of Brandon's Expanded Industrial Wastewater Treatment Facility for Maple Leaf Pork's Second Shift, Brandon, Manitoba". Earth Tech Canada Inc. March 2003. Submitted by Kenneth Adam, Earth Tech Consultants Inc.
21.	"Summary of City of Brandon/Maple Leaf Open Houses Re: Expansion of the Industrial Waste Water Treatment Facility and Maple Leaf Pork". Submitted by Kenneth Adam, Earth Tech Consultants Inc.
22.	*Curriculum Vitae*: J. Willis Sneed. Submitted by J. Willis Sneed, HDR Engineering Inc.
23.	*Visual Projections (Slides):* "IWWTF Expansion City of Brandon". Submitted by J. Willis Sneed, HDR Engineering Inc.
24.	"Maple Leaf Pork - Brandon, Manitoba - Expanded Biological Treatment for 18,000 Hogs/Day: Preliminary Study and Report". HDR Engineering Inc. Submitted by J. Willis Sneed, HDR Engineering Inc.
25.	*Curriculum Vitae*: Lawrence Novachis. Submitted by Lawrence Novachis, Zenon Environmental Inc.
26.	*Visual Projections (Slides):* "City of Brandon IWWTF Expansion". Submitted by Lawrence Novachis, Zenon Environmental Inc.
27.	*Curriculum Vitae*: Sunny Mangat. Submitted by Sunny Mangat, Earth Tech Consultants Inc.
28.	*Visual Projections (Slides):* "City of Brandon Industrial Wastewater Treatment Facility Expansion: Interconnecting Piping and Pumping Station". Submitted by Sunny Mangat, Earth Tech Consultants Inc.
29.	"Public Hearing - City of Brandon Industrial Wastewater Treatment Facility: Statement on Scope". Manitoba Clean Environment Commission.
30.	*Curriculum Vitae*: Frederike Schneider-Vieira. Submitted by Frederike Schneider-Vieira, North/South Consultants Inc.
31.	*Curriculum Vitae*: Megan Cooley. Submitted by Megan Cooley, North/South Consultants Inc.
32.	*Visual Projections (Slides):* "Assiniboine River Study (Brandon to Portage la Prairie Reach) Assessment of IWWTF Expansion". Submitted by Frederike Schneider-Vieira, North/South Consultants Inc.
33.	"Assiniboine River Monitoring Study: Water Quality Component: Water Quality Assessment and Model for the Open-Water Season, 2002". North/South Consultants Inc. Submitted by Frederike Schneider-Vieira, North/South Consultants Inc.
34.	*Visual Projections (Slides):* "Assiniboine River Instream Flow Study Update". Submitted by Joel Hunt, Manitoba Conservation.
35.	*Motion*, untitled, submitted by Glen Koroluk, Westman Community Action Coalition.
36.	*Letter*, dated May 15, 2003, from Norm Brandson, Manitoba Conservation, to Glen Koroluk, Hog Watch Manitoba Inc. Submitted by Glen Koroluk, Westman Community Action Coalition.
37.	*Verbatim Transcript* (excerpt) "Series I, Volume 1, December 11, 2001: Simplot Canada Ltd. - Potato Processing Plant/City of Portage la Prairie - Water Pollution Control Facility".

No.	Description
	Manitoba Clean Environment Commission. Submitted by Glen Koroluk, Westman Community Action Coalition.
38.	*E-Mail Correspondence*, various dates, from various (Adam, Paton, Moche, Strachan) to various (Adam, Duguid, Koroluk, Moche, Paton, Strachan) with attachments. Submitted by Bill Paton, Westman Community Action Coalition
39.	*E-Mail Correspondence* dated June 23, 2003, from Clem Moche, Manitoba Conservation to Bill Paton, Westman Community Action Coalition, with attachment. Submitted by Adam Schneider, Westman Community Action Coalition.
40.	*Brief* "Representation by: Ron Dalmayn, The Organization. Re: The Brandon-Maple Leaf Meats Sewage Treatment Plant, Brandon, June 26/03". Submitted by Ron Dalmyn, The Organization.
41.	*Brief* "Representation to: Manitoba Clean Environment Commission Public Hearing Respecting a Proposal Submitted by the City of Brandon, for the Expansion to Brandon's Industrial Wastewater Treatment Facility and the Expansion of Maple Leaf Foods' Pork Processing Plant in the City of Brandon". Brandon Chamber of Commerce. Submitted by Barry Cullen, Brandon Chamber of Commerce.
42.	*Visual Projections (Slides)*, untitled, submitted by Glen Koroluk, Westman Community Action Coalition.
43.	*Supporting Documentation*, various items, submitted by Bill Paton, Westman Community Action Coalition.
44.	"Planning Stats (March 19, 2003)" and attached *map* "Local/Municipal and District Planning". Submitted by Ed Sawatzky, Manitoba Intergovernmental Affairs.
45.	"Conditional Use Process for 400+ Livestock Operations: The Planning Act (Bill 35)". Submitted by Ed Sawatzky, Manitoba Intergovernmental Affairs.
46.	"Regulatory Framework for Livestock Operations in Manitoba". June 23, 2003. Submitted by Sylvio Tessier, Manitoba Conservation.
47.	*Visual Projections (Slides)*: "Consequences of An Additional 2.5 Million Pigs on Assiniboine Watershed & Rural Groundwater". Submitted by Bill Paton, Westman Community Action Coalition.
48.	"Upper Assiniboine River Basin Study. Main Report. Environment Canada, Sask Water and Manitoba Conservation. November 2000". Submitted by Bill Paton, Westman Community Action Coalition.
49.	"Briefing notes Prepared by Glen Koroluk in attendance of The Canadian Water Resources Association Symposium on Understanding Climate Change Impacts on Manitoba's Water Resources, June 17, 2003, Winnipeg: Alf Warkentin, Manitoba Conservation - Water Resources Branch". Submitted by Bill Paton, Westman Community Action Coalition.
50.	*Internet Pages*: "Appendix I: Examples of Health Risks by Economic Sector (Continued)". Canadian Handbook on Health Impact Assessment. Health Canada. Submitted by Bill Paton, Westman Community Action Coalition.
51.	*Press Release*: "New Pollution Concerns with Hog Slurry". Dr. Bill Paton. October 19th, 2000. Submitted by Bill Paton, Westman Community Action Coalition.
52.	*Correspondence*, various. Submitted by Glen Koroluk, Westman Community Action Coalition.
53.	*Correspondence*, various, "Groundwater". Submitted by Glen Koroluk, Westman Community Action Coalition.
54.	*Correspondence*, various, "Decommissioning". Submitted by Glen Koroluk, Westman Community Action Coalition.
55.	*Correspondence*, various, "Canadian Standards Association". Submitted by Glen Koroluk,

No.	Description
	Westman Community Action Coalition.
56.	*Resolution*: "Antimicrobial Use and Resistance". American Medical Association House of Delegates. May 8, 2001. Submitted by Glen Koroluk, Westman Community Action Coalition.
57.	*Letter*, dated April 14, 2003, from Dana Hanson, Canadian Medical Association, to Hon. Anne McLellan, Minister of Health. Submitted by Glen Koroluk, Westman Community Action Coalition.
58.	*Visual Projections (Slides)*: "The North/South River Study: A Critique by Bill Paton". Submitted by Bill Paton, Westman Community Action Coalition.
59.	*Letter*, undated, from Bill Paton, Brandon University (unsigned), to Larry Strachan, Manitoba Environment. Submitted by Bill Paton, Westman Community Action Coalition.
60.	*Letter*, undated, from Bill Paton, Brandon University, to Larry Strachan, Manitoba Environment. Submitted by Bill Paton, Westman Community Action Coalition.
61.	"North South Sampling Dates For Sites 1-14". Submitted by Bill Paton, Westman Community Action Coalition.
62.	*Visual Projections (Slides)*, untitled, submitted by Adam Schneider, Westman Community Action Coalition.
63.	Visual Projection (Slides): "Greenhouse Gas Inventory". Submitted by Kamil Zaniewski, Westman Community Action Coalition.
64.	"Intensive Hog Farming in Manitoba: Transitional Treadmills and Local Conflicts". Joel Novek CRSA/RCSA, No. 40.1. 2003. Submitted by Joel Novek.
65.	"Presentation to the Clean Environment Commission Hearings on the Proposed Maple Leaf Expansion - July 15, 2003". Winnipeg Humane Society. Submitted by Vicki Burns, Winnipeg Humane Society.
66.	Brief, untitled, submitted by Alan Baron.
67.	*Visual Projections (Slides)*: "Organic Livestock Management: The Opportunities in Diversifying Livestock Production". Submitted by Janine Gibson, Canadian Organic Growers.
68.	"Labour Economics and Workforce Implications of Increased Hog Production in Brandon, Manitoba: A Submission to the Clean Environment Commission Hearings on the Industrial Waste Water Treatment Facility". Submitted by Todd Scarth, Canadian Centre for Policy Alternatives - Manitoba.
69.	*Brief*, untitled, submitted by Al Rogosin.
70.	"Occupational Health Considerations of Livestock Industry Expansion: Written Submission by the MFL Occupational Health Centre, Inc. to the Clean Environment Commission Public Hearings City of Brandon Industrial Wastewater Treatment Plant Expansion: July 2003". Submitted by Patricia Hebert, MFL Occupational Health Centre.
71.	*Brief*, untitled, submitted by Ruth Pryzner.
72.	"Concerned Daly Ratepayers Inc. Submission to the Clean Environment Commission Hearing on the Proposed Maple Leaf Expansion, Held at the Victoria Inn, Brandon Manitoba on July 15, 2003". Submitted by Joe Dolecki, Concerned Daly Ratepayers Inc.
73.	"Clarification of Information Presented to CEC". Submitted by Chris Hayhurst, Simplot Canada Limited.
74.	*Brief*, untitled, with attachments, submitted by Andrew Dickson, Manitoba Agriculture and Food.
75.	"Submission to Manitoba Clean Environment Commission: Brandon, Manitoba: July 15, 2003". Submitted by Ed Sawatzky, Manitoba Intergovernmental Affairs.
76.	*Visual Projections (Slides)*: "Sustainability of Water Quality in Relation to Expansion of the Hog Production Sector in Manitoba". Submitted by Dwight Williamson, Manitoba

No.	Description
	Conservation.
77.	"Manitoba Conservation Presentation to Clean Environment Commission, July 15, 2003". Submitted by Al Beck, Manitoba Conservation.
78.	"Water Management and Climate Change in Manitoba: A Proposed Approach for Manitoba Conservation". Submitted by Larry Strachan, Manitoba Conservation.
79.	*Curriculum Vitae*: Paul W. Bowen. Submitted by Paul Bowen, Terraprobe Limited.
80.	"City of Brandon: Maple Leaf Meats: Ground Water Monitoring Program Brandon, Manitoba". Terraprobe Limited. Submitted by Paul Bowen, Terraprobe.
81.	*Visual Projections (Slides)*: "Environmental Impact and Sustainability of Hog Operations Related to Maple Leaf Brandon Second Shift Expansion". Submitted by Anne Tennier, Maple Leaf Foods.
82.	*Letter*, dated June 26, 2003, from Steve Racine, Manitoba Métis Federation to Clean Environment Commission. Submitted by Steve LeBlanc, Maple Leaf Foods Inc.
83.	*Visual Projections (Slides)*: "Groundwater Monitoring at Maple Leaf Meats & IWWTF 1999-2003: The Terraprobe Reports". Submitted by Bill Paton, Westman Community Action Coalition.
84.	*Visual Projections (Slides)*: "The Brandon Industrial Waste Treatment Plant: Phase 1 (1 shift) & Phase 2 (2 shifts)". Submitted by Bill Paton, Westman Community Action Coalition.
85.	*Visual Projections (Slides)*: "Solid Wastes Municipal Sludge, Industrial Sludge & Manure: An Insurmountable and Limiting Problem for Brandon & Maple Leaf Meats". Submitted by Bill Paton, Westman Community Action Coalition.
86.	*Table*: "Summary of Land Required Estimations Based on 125 m^3 of Sludge Per Hectare". Submitted by Bill Paton, Westman Community Action Coalition.
87.	*Newspaper Clipping*: "No heads-up from city raises questions." Dr. Bill Paton. Brandon Sun. May 22, 2003. Submitted by Bill Paton, Westman Community Action Coalition.
88.	"Zoonotic Infections of Pigs". Paul D. Lewis, Jr. Submitted by Bill Paton, Westman Community Action Coalition.
89.	"Additional Information on Pathogen Transport". OSRAS Review. April, 2001. Submitted by Bill Paton, Westman Community Action Coalition.
90.	"Uses of Antimicrobials in Food Animals in Canada: Impacts on Resistance and Human Health". Advisory Committee on Animal Uses of Antimicrobials and Impact on Resistance and Human Health. June, 2002. Submitted by Bill Paton, Westman Community Action Coalition.
91.	"Responses to Dr. Bill Paton's Questions Contained in Your Fax of July 3, 2003". Submitted by Ted Snure, City of Brandon.
92.	*Map*: "Brandon Wastewater Outfalls". Submitted by Ted Snure, City of Brandon.
93.	*Table*: "City of Brandon Industrial & Municipal Wastewater Facilities: Total Phosphorous Loading for Effluent Discharges in 2002". Submitted by Ted Snure, City of Brandon.
94.	*Table*: "City of Brandon Industrial & Municipal Wastewater Facilities: Total Nitrogen Loading for Effluent Discharges in 2002". Submitted by Ted Snure, City of Brandon.
95.	Brief, untitled, submitted by Adam Schneider, Westman Community Action Coalition.

Appendix D

Glossary of Terms

Aeration: The mixing or turbulent exposure of water to air and oxygen to dissipate volatile contaminants and other pollutants into the air.

Aerobic: Living or occurring in the presence of oxygen.

Aerobic bacteria: These bacteria require molecular oxygen in order to consume food (organic material and nutrients). If not enough oxygen is present, the treatment process will suffer because the bacteria cannot do the required steps. When these bacteria predominate, there should be no foul odour, just a musty or earthy smell.

Anaerobic bacteria: Bacteria that become inactive in the presence of molecular oxygen. They oxidize food by stripping oxygen from other sources such as sulphate and sulphite. If wastewater is without oxygen for long periods of time, the odours will be unpleasant (e.g. rotten egg smell), the water will be septic, and damage to concrete and metal can occur because of the formation of sulphuric acid.

Anoxic: Without oxygen.

Algae: Any of a large group of simple plants that contain chlorophyll; are not divisible into roots, stems and leaves; do not produce seeds; and include the seaweeds and related freshwater and land plants.

Anaerobic bacteria: Any bacteria that can survive in the complete or partial absence of air.

Aquifer: An underground layer of unconsolidated rock or soil that is saturated with usable amounts of water (a zone of saturation).

Bacteria: Single-cell microbes that grow in nearly every environment on Earth. They are used to study diseases and produce antibiotics, to ferment foods, to make chemical solvents, and in many other applications.

Biofouling: Tends to occur in all membrane processes such as membrane bioreactors where microorganisms and nutrients are present. It is a complex process that varies depending on the application, and can result in loss of performance and costly cleaning and process shutdown.

Biosolids: A nutrient-rich organic material resulting from the treatment of wastewater. Biosolids contain nitrogen and phosphorus along with other supplementary nutrients in smaller amounts, such as potassium, sulphur, magnesium, calcium, copper and zinc. Soil that is lacking in these substances can be reclaimed with biosolids use. The application of biosolids to land can improve soil properties and plant productivity, and also reduce dependence on inorganic fertilizers.

BOD (Biochemical Oxygen Demand): A measure of the amount of oxygen used up in the aerobic decomposition of organic matter. It gives a direct measurement of the strength of wastewater, usually expressed in mg/L (milligrams per Litre). By measuring the amount of oxygen bacteria use over a period of time (e.g. 5 days), the amount of organic matter in that sample can

be determined. This test is reported in mg/L. A high BOD in the effluent is undesirable because it would deplete oxygen needed by fish in the river.

COD Chemical Oxygen Demand): The quantity of oxygen used in biological and non-biological oxidation of materials in water.

Coliform bacteria: Non-pathogenic microorganisms used in testing water to indicate the presence of pathogenic bacteria.

Contaminant: An impurity that causes air, soil or water to be harmful to human health or the environment.

Cumulative: Increasing or enlarging by successive addition; acquired by or resulting from accumulation.

Cumulative environmental effects/impact: Effects of a project in combination with the effects of other past, present and future environmental effects.

Decomposition: The process of rotting and decay that causes the complex organic materials in plants and animals to break down into simple inorganic elements which can be returned to the atmosphere and soil.

Digestion: Decomposition of organic waste materials by the action of microbes; the process of sewage treatment by the decomposition of organic matter.

Denitrification: Bacterial conversion of nitrate to nitrogen gas (released to the atmosphere). In the absence of elemental oxygen, facultative bacteria use the oxygen atoms in the nitrate molecule as an electron acceptor.

Dilution: The act of making thinner or more liquid by adding to the mixture; the act of diminishing the strength, flavour, or brilliance of by adding to the mixture.

Discharge: The volume of water that passes a given location within a given period of time (usually expressed in cubic metres per second).

Disinfection: The inactivation or killing of pathogens. This wastewater treatment facility uses UV lamps to disrupt the DNA of pathogens, which makes them unable to reproduce. Most plants use chlorine but it's dangerous to handle and may create unhealthful by-products. Disinfection is not the same as sterilization, which is killing all organisms and not just the ones that cause disease.

Disposal: Disposing of or getting rid of something, as in the disposal of waste material.

Dissolved oxygen (DO): Amount of oxygen gas dissolved in a given quantity of water at a given temperature and atmospheric pressure. It is usually expressed as a concentration in parts per million or as a percentage of saturation.

Drainage basin: Land area where precipitation runs off into streams, rivers, lakes, and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large drainage basins, like the area that drains into the Mississippi River, contain thousands of smaller drainage basins. Also called a "watershed."

Effluent: Any substance, particularly a liquid that enters the environment from a point source. Generally refers to wastewater from a sewage treatment or industrial plant.

Emission: A substance discharged into the atmosphere.

Environment: Components of the Earth and includes land, water and air, including all layers of the atmosphere; all organic and inorganic matter and living organisms; and the interconnecting natural systems.

Environmental effect: Any adverse or beneficial change in the environment that a project causes, and any change to a project caused by the environment.

Environmental assessment: Process of identifying, predicting, evaluating and mitigating biophysical, social and other relevant effects of development proposals prior to making major decisions or commitments.

Environmental Impact Assessment (EIA): Report prepared when the environmental assessment process is applied to a specific project or development.

Environmental Management System (EMS): The part of an organization's overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the organization's environmental policy.

Facultative bacteria: Bacteria can be classified into different types:**Aerobic** types (which require oxygen to live) and **anaerobic** (which can live without oxygen). **Facultative** types can thrive under both aerobic and anaerobic conditions.

Follow-up: Activities to verify the accuracy of an environmental assessment and evaluate any measure taken to mitigate or optimize a project's environmental effects.

Giardia: a protozoan parasite *Giardia intestinalis* that can cause disease in humans when they drink water containing giardia or its cyst that is either inadequately filtered or disinfected. .The resulting disorder is more prevalent in children than in adults, and is characterized by abdominal discomfort, nausea, and alternating constipation and diarrhea.

Ground water (groundwater): 1) water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper surface of the saturate zone is called the water table. 2) Water stored underground in rock crevices and in the pores of geologic materials that make up the Earth's crust.

Heavy metals: A certain class of metals found in nature such as nickel, cadmium, lead, copper, mercury, silver, gold, and zinc. Heavy metal concentrated in water may be harmful to aquatic life, plants, or human health.

Influent: Any substance, particularly a liquid stream that enters or flows into a treatment system. Generally refers to wastewater going into a sewage treatment or industrial plant.

ISO 14001 Standard: International Organization for Standardization for Environmental Management Systems – Specification with guidance for use.

Lagoon: As a wastewater treatment method, an animal waste treatment method which uses a deep pond to treat manure and other runoff from a livestock operation; may be aerobic or anaerobic (both use bacteria to break down wastes).

Landfill: A large, outdoor area for waste disposal; landfills where waste is exposed to the atmosphere (open dumps) are now illegal; in "sanitary" landfills, waste is layered and covered with soil.

Liner: A clay or plastic material placed between garbage and soil in a landfill to prevent rotting garbage from coming in contact with groundwater.

Microbial digestion: Breakdown and use of a substance by microorganisms.

Microorganisms: Organisms too small to be seen with the unaided eye, including bacteria, protozoans, yeasts, viruses, and algae.

Mitigation: A practice, design feature or technology that, when applied to a project, reduces adverse environmental effects.

Monitoring: Scrutinizing and checking systematically with a view to collecting data.

Nitrates: Used generically for materials containing this ion group made of nitrogen and oxygen; sources include animal wastes and some fertilizers; can seep into groundwater; linked to human health problems, including "blue baby" syndrome (methemoglobinemia). A highly mobile form of nitrogen, in large enough amounts it is considered a drinking water contaminant. The maximum amount of nitrate-nitrogen allowed in drinking water is 10 parts per million.

Nitrification: The biochemical oxidation of ammonium to nitrate.

Nitrogen: A main nutrient for critical survival and essential element for plant growth, comprising 78% of the atmosphere. Organisms use nitrogen for protein synthesis and plants use it for photosynthesis.

Nutrient: Nutrients are substances that provide nourishment and promote growth in plants and animals. Two nutrients important to river systems are nitrogen and phosphorus. Organisms use nitrogen in protein synthesis and plants use nitrogen for photosynthesis. Phosphorus is important in metabolic processes that involve the transfer of energy. Excess nutrients can cause increased algal growth in the river; when the algae die they sink to the bottom where they decompose, causing a reduction in dissolved oxygen. An imbalance of nutrients can also create conditions where toxic blue-green algae dominate.

Organic material: Material derived from organic, or living, things; also, relating to or containing carbon compounds.

Outfall: the place where a sewer, drain, or stream discharges; the outlet or structure through which reclaimed water or treated effluent is finally discharged to a receiving water body.

Pathogens: Organisms that can cause disease. Many of the pathogens in wastewater are killed during the treatment process before disinfection because the environment is not right for them. Other pathogens (e.g. *E. coli*) that can survive in many different environments need to be removed by disinfection.

pH: A measure of the concentration of hydrogen ions in a solution; the pH scale ranges from 0 to 14, where 7 is neutral and values less than 7 are acidic and values greater than 7 are basic or alkaline; pH is an inverted logarithmic scale so that every unit decrease in pH means a 10-fold increase in hydrogen ion concentration. Thus, a pH of 3 is 10 times as acidic as a pH of 4 and 100 times as acidic as a pH of 5.

Phosphate: Used generically for materials containing a phosphate group; sources include some fertilizers and detergents; when wastewater containing phosphates is discharged into surface waters, these chemicals act as nutrient pollutants (causing overgrowth of aquatic plants).

Phosphorus: A plant nutrient that can cause an overabundance of bacteria and algae when high amounts are present, leading to a depletion of oxygen and fish kills. High levels of phosphorus in water are usually caused by agricultural runoff or improperly operating wastewater treatment plants.

Precipitate: Solid which has come out of an aqueous solution. (e.g. iron from groundwater precipitates to a rust coloured solid when exposed to air).

Primary wastewater treatment: The first stage of the wastewater-treatment process where mechanical methods, such as filters and scrapers, are used to remove pollutants. Solid material in sewage also settles out in this process.

Secondary wastewater treatment: Treatment (following primary wastewater treatment) involving the biological process of reducing suspended, colloidal, and dissolved organic matter in effluent from primary treatment systems and which generally removes 80 to 95% of the Biochemical Oxygen Demand (BOD) and suspended matter. Secondary wastewater treatment may be accomplished by biological or chemical-physical methods. Activated sludge and trickling filters are two of the most common means of secondary treatment. It is accomplished by bringing together waste, bacteria, and oxygen in trickling filters or in the activated sludge process. This treatment removes floating and settleable solids and about 90% of the oxygen-demanding substances and suspended solids. Disinfection is the final stage of secondary treatment.

Sewage treatment plant: A facility designed to receive the wastewater from domestic sources and to remove materials that damage water quality and threaten public health and safety when discharged into receiving streams or bodies of water. The substances removed are classified into four basic areas: 1) greases and fats; 2) solids from human waste and other sources; 3) dissolved pollutants from human waste and decomposition products; and 4) dangerous microorganisms. Most facilities employ a combination of mechanical removal steps and bacterial decomposition to achieve the desired results. Chlorine is often added to discharges from the plants to reduce the danger of spreading disease by the release of pathogenic bacteria.

Significance: A judgement made based on the attributes of an environmental effect as determined by the application of a suitable framework.

Sludge: The solids in the basin that settle. It is mostly composed of bacteria and unconsumed organic matter.

Streamflow: The water discharge that occurs in a natural channel. A more general term than runoff, streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Surface water: Water that is on the Earth's surface, such as in a stream, river, lake or reservoir.

Suspended solids: Solids that are not in true solution and that can be removed by filtration. Such suspended solids usually contribute directly to turbidity. As defined in waste management, these are small particles of solid pollutants that resist separation by conventional methods.

Sustainable development: Meeting the needs of the present without compromising the ability of future generations to meet their own needs (Manitoba Sustainable Development Act).

Tertiary wastewater treatment: Selected biological, physical, and chemical separation processes to remove organic and inorganic substances that resist conventional treatment practices; the additional treatment of effluent beyond that of primary and secondary treatment methods to obtain a very high quality of effluent. The treatment process typically involves a three-phase process: first, in the primary wastewater treatment process, which incorporates physical aspects, untreated water is passed through a series of screens to remove solid wastes; second, in the secondary wastewater treatment process, typically involving biological and chemical processes, screened wastewater is then passed a series of holding and aeration tanks and ponds; and third, the tertiary wastewater treatment process consists of flocculation basins, clarifiers, filters, and chlorine basins or ozone or ultraviolet radiation processes.

TSS (Total Suspended Solids): A required test where a sample of known volume is passed through a filter and the solids remaining on the filter are weighed. Reported as mg/L (milligrams per Litre). Too much TSS in the effluent would be seen as cloudiness, and also as an indication that there is a problem with the process.

Treatment plant: Facility for cleaning and treating fresh water for drinking, or cleaning and treating wastewater before discharging into a water body.

Ultraviolet light: Similar to light produced by the sun; produced by special lamps. As organisms are exposed to this light, they are damaged or killed.

Wastewater: Water that has been used in homes, industries, and businesses that is not for reuse unless it is treated.

Wastewater treatment: Physical, chemical, and biological processes used to remove pollutants from wastewater before discharging it into a water body.

Water conservation: Practices that reduce water use.

Water quality: A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Water use: Water that is used for a specific purpose, such as for domestic use, irrigation, or industrial processing. Water use pertains to human interaction with and influence on the hydrological cycle, and includes elements such as water withdrawal from surface- and groundwater sources, water delivery to homes and businesses, consumptive use of water, water released from wastewater treatment plants, water returned to the environment, and instream uses, such as using water to produce hydroelectric power.

Watershed: The land area that drains water to a particular stream, river, or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large watersheds, like the Mississippi River basin, contain thousands of smaller watersheds.